











MÉMOIRES

ET

COMPTES RENDUS

DE

LA SOCIÉTÉ ROYALE

DU

CANADA

TROISIÈME SÉRIE—TOME X.

SÉANCE DE MAI 1916

EN VENTE CHEZ

JAS. HOPE ET FILS, OTTAWA; LA CIE COPP-CLARK (LIMITÉE) TORONTO
BARNARD QUARITCH, LONDRES, ANGLETERRE

1917

PROCEEDINGS
AND
TRANSACTIONS
OF
THE ROYAL SOCIETY
OF
CANADA

THIRD SERIES—VOLUME X.

MEETING OF MAY 1916

FOR SALE BY
JAS. HOPE & SON, OTTAWA; THE COPP-CLARK CO. (LIMITED) TORONTO
BERNARD QUARITCH, LONDON, ENGLAND

1917



TABLE OF CONTENTS

<i>List of Officers of the Society 1916-17.....</i>	1
<i>List of Fellows and Corresponding and Retired Members....</i>	2-6
<i>List of Presidents.....</i>	7
<i>List of Associated Societies.....</i>	8-9

PROCEEDINGS.

<i>List of Officers and Fellows present.....</i>	I-II
<i>Unable to attend.....</i>	II
<i>List of Fellows on Active Service.....</i>	II
<i>Minutes of Annual Meeting, 1915, confirmed.....</i>	II
<i>Report of Council.....</i>	II
1. <i>Proceedings and Transactions, Current volume.....</i>	III
2. <i>Election of New Members.....</i>	III-IV
3. <i>Deceased Members.....</i>	IV-XV
4. <i>Advisory Assistance to the Government in Research Work</i>	XV
5. <i>Permanent Quarters for the Society.....</i>	XVI
6. <i>The War.....</i>	XVII
7. <i>The 72-inch Reflecting Telescope.....</i>	XVII
8. <i>The Diploma.....</i>	XVIII
9. <i>The Charter Book.....</i>	XVIII
10. <i>A National Library.....</i>	XVIII
11. <i>Commemoration of Confederation.....</i>	XVIII
12. <i>Finances of the Society.....</i>	XIX
13. <i>Report of the Honorary Librarian.....</i>	XX

GENERAL BUSINESS.

<i>Report of Council received.....</i>	XXI
<i>Confirmation of Election and Introduction of New Members..</i>	XXI-XXII
<i>Election of Prof. W. H. Siebert as a Corresponding Member..</i>	XXI-XXII
<i>Amendment of By-Laws for election of Fellows in Section IV</i>	XXII
<i>Presidential Address.....</i>	XXII
<i>Report of Council Adopted.....</i>	XXII
<i>Motion Endorsing views of President regarding the study of French Language and Literature in Canadian Schools.....</i>	XXIII

<i>Further Report of Committee to obtain information on the use of Carbon Monoxide in Illuminating Gas. . . .</i>	XXIII
<i>Resolution regarding Advisory Assistance to the Government in Research Work.</i>	XXV
<i>Reports of Associated Societies.</i>	XXV
<i>Popular Lecture.</i>	XXVI
<i>Reports of Sections.</i>	XXVII — XXXVII
<i>President's Report of Interview with the Government regarding Research work.</i>	XXXVII
<i>Report of the Nominating Committee.</i>	XXXVII
<i>Adoption of report of Nominating Committee.</i>	XXXVII
<i>General Printing Committee.</i>	XXXVII
<i>Vote of thanks to Officers and Council.</i>	XXXVIII

APPENDICES.

A.—PRESIDENTIAL ADDRESS.

<i>Canada's Intellectual Status and Intellectual Needs. By ALFRED BAKER, M.A., LL.D., F.R.S.C.</i>	XLI
<i>B.—The Dominion Astronomical Observatory.</i>	LXXV
<i>C.—The Meteorological Service of Canada. By SIR ROBERT F. STUPART, Kt., F.R.S.C.</i>	LXXXIII
<i>D.—Department of Inland Revenue, Laboratory Branch. By A. MCGILL, B.A., B.Sc., LL.D.</i>	CV
<i>E.—Department of the Interior, Forestry Branch, Forest Product Laboratories. By JOHN S. BATES, CHEM. E., Ph.D.</i>	CXI

TRANSACTIONS.

SECTION I.

<i>La Saint-Jean-Baptiste, 1636-1836. Par BENJAMIN SULTE. . .</i>	1
<i>Un chapitre d'histoire contemporaine—Le cardinal Sa'olli. PAR MGR. LOUIS-AD. PAQUET.</i>	27
<i>Un essai d'arbitrage international. Par P. B. MIGNAULT.</i>	49
<i>La prévôté de Québec. Par PIERRE-GEORGES ROY.</i>	119
<i>Au pays natal de Lamartine. PAR ERNEST CHOQUETTE.</i>	129
<i>Les métamorphoses dans les contes populaires canadiens. Par C.-MARIUS BARBEAU.</i>	143

TABLE OF CONTENTS

III

<i>A propos d'une opinion de Montalembert sur le Canada.</i> Par ANTONIO PERRAULT.....	247
<i>Les tribunaux et les officiers de justice, à Montréal, sous le régime français 1648-1760.</i> Par E. Z. MASSICOTTE.....	273
<i>Des vocables algonquins, caraïbes, etc., qui sont entrés dans la langue.</i> Par le SÉNATEUR P. POIRIER.....	339
<i>Introduction à l'étude de l'économie Politique.</i> Par EDOUARD MONTPETIT.....	365

SECTION II.

<i>Presidential Address.—The Economic Effect of War upon Canada.</i> By ADAM SHORTT.....	65
<i>The Refugee Loyalists of Connecticut.</i> By W. H. SIEBERT.....	75
<i>An Historical War Crop—The Canadian Wheat Crop of 1915.</i> By C. C. JAMES.....	93
<i>The Contest for the Command of Lake Ontario in 1812 and 1813.</i> By E. A. CRUIKSHANK.....	161
<i>Thucydides and History.</i> By MAURICE HUTTON.....	225
<i>The Canadian Snowshoe.</i> By THOMAS DRUMMOND.....	305
<i>Canadian State Trials; The King v. David McLane.</i> By HON. MR. JUSTICE RIDDELL.....	321
<i>Joseph Howe and the Anti-Confederation League.</i> By LAWRENCE J. BURPEE.....	409
<i>Signposts of Prehistoric Time.</i> By W. D. LIDTHALL.....	469
<i>The Romance of a Manuscript.</i> By SIR WILLIAM PETERSON, K.C.M.G.....	475
<i>The Poetry of To-day.</i> By ARTHUR L. PHELPS.....	481
<i>Place-Names in the Rocky Mountains between the 49th Parallel and the Athabaska River.</i> By JAMES WHITE.....	501

SECTION III.

<i>Presidential Address.—Agricultural Education and Research in Canada.</i> By Frank T. SHUTT.....	1
<i>Factors connecting the Concentration and the Optical Rotatory Power of Aqueous Solutions of Nicotine.</i> By ALFRED TINGLE AND ALLAN A. FERGUSON.....	19
<i>A New Method for the Determination of Nicotine in Tobacco.</i> By ALFRED TINGLE AND ALLAN A. FERGUSON.....	27
<i>The Smelting of Titaniferous Ores of Iron.</i> By ALFRED STANS- FIELD AND W. A. WISSLER.....	33
<i>The Structure of Hailstones of Exceptional Form and Size.</i> By FRANCIS E. LLOYD.....	47

<i>Comparison of the Callendar Sunshine Recorder and the Angstrom Pyrheliometer.</i> By JOHN PATTERSON.....	51
<i>On the Release of Radium Emanation from water at different Temperatures by the Bubbling Method.</i> By J. MORAN..	57
<i>The Double Salts formed by Sodium and Potassium Carbonates</i> By J. W. BAIN AND C. E. OLIVER.....	65
<i>The Occlusion of Iron by the Ammonium Phospho-Molybdate Precipitate.</i> By E. H. ARCHIBALD AND H. B. KEEGAN	67
<i>The Solubility of Aluminium Hydroxide in Solutions of Ammonia and of Ammonium Salts.</i> By E. H. ARCHIBALD AND Y. HABASIAN.....	69
<i>The Turn of Tidal Streams in Relation to the Time of the Tide.</i> By W. BELL DAWSON.....	71
<i>A Comparison of Radium Standard Solutions.</i> By J. MORAN..	77
<i>Improved Methods in Hygrometry.</i> By A. NORMAN SHAW.....	85
<i>Production of Ring Ice or Hoar Frost in Pipes.</i> By H. T. BARNES.....	93
<i>The Algebraic Basis of Certain Bessel Series, including more particularly the Newmann Series of the Second Kind.</i> By James Harkness.....	97
<i>Concerning a Certain Completely Integrable System of Partial Differential Equations.</i> By CHARLES T. SULLIVAN...	121
<i>Contact Resistance between Conductors in Relative Motion.</i> By VIOLET HENRY.....	135
<i>Contact Resistance in Oil.</i> By H. E. REILLEY AND VIOLET HENRY.....	145
<i>On the Initial Charged Condition of the Active Deposits of Radium, Thorium and Actinium.</i> By H. G. HENDERSON.....	151
<i>Human Adipocere.</i> By R. F. RUTTAN.....	169
<i>Alternate Numbers as Geometrical Indices.</i> By J. C. GLASHAN..	171

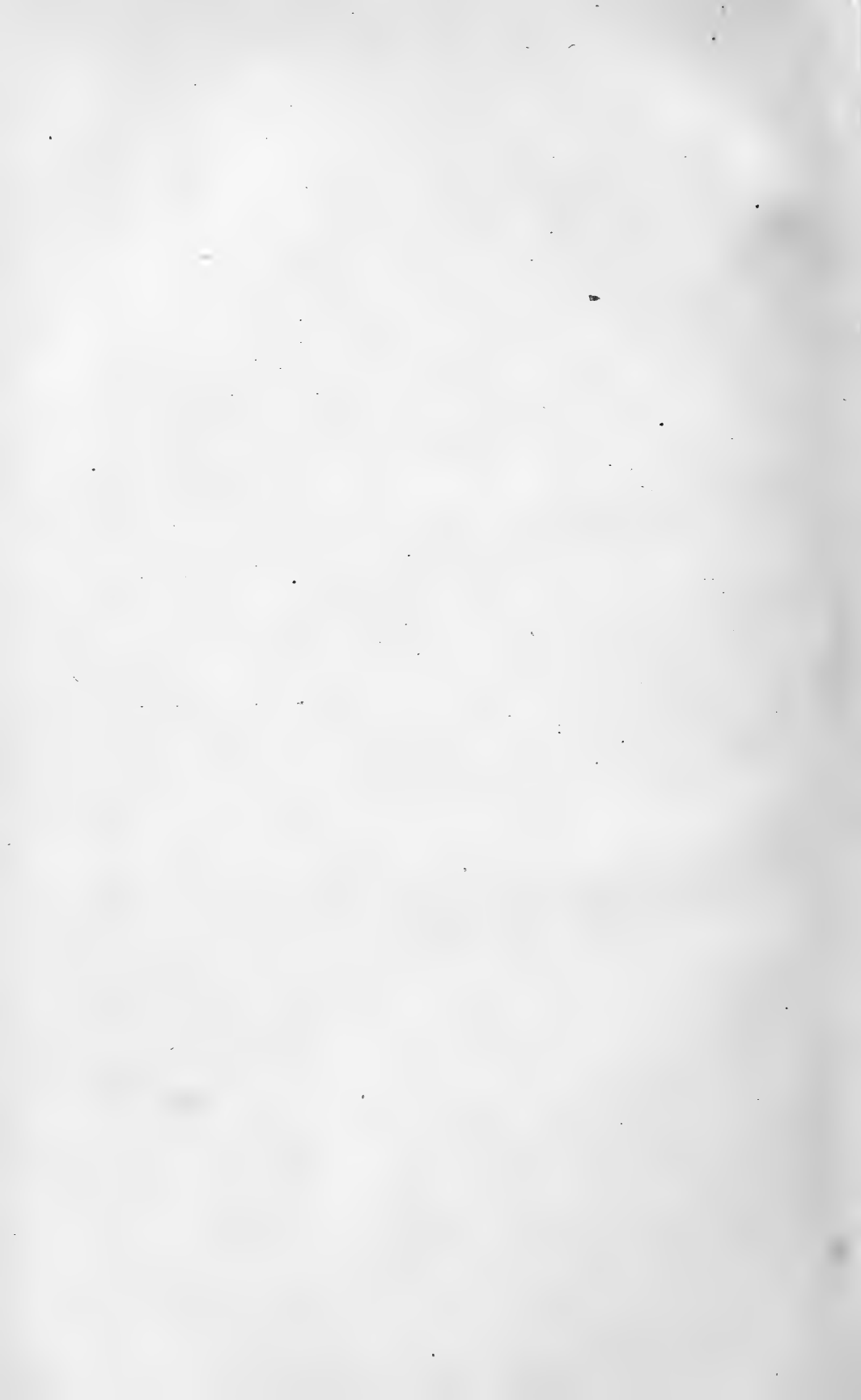
SECTION IV.

<i>Presidential Address.—Notes on the Geology of Nelson and Hayes Rivers.</i> By J. B. TYRRELL.....	1
<i>Chondropystrophia Fætalis; A Study in Development.</i> By ALBERT G. NICHOLLS.....	29
<i>Ganoid Fishes from near Banff, Alberta.</i> By LAWRENCE M. LAMBE.....	35
<i>Notes on Cambrian Faunas, No. 12.</i> By G. F. MATTHEW.....	45

TABLE OF CONTENTS

v

<i>The Abscission of Flower-buds and Fruits in Gossypium, and its Relation to Environmental Changes.</i> By FRANCIS E. LLOYD.....	55
<i>Studies on the Protozoan Parasites of the Fishes of the Georgian Bay.</i> By J. W. MAVOR.....	63
<i>Notes on the Plankton of the British Columbia Coast.</i> By J. PLAYFAIR McMURRICH.....	75
<i>Halimmedusa, a new Genus of Anthomedusæ.</i> By HENRY B. BIGELOW.....	91
<i>On the Development of Æquorea Forskalea.</i> By C. McLEAN FRASER.....	97
<i>The Quantitative Study of Climatic Factors in Relation to Plant Life.</i> By J. ADAMS.....	105
<i>Geological Structure of the Basin of Lake St. John, Quebec.</i> By JOHN A. DRESSER.....	125
<i>Bibliography of Canadian Geology for 1915.</i> By WYATT MALCOLM.....	131
<i>Bibliography of Canadian Entomology for the year 1915.</i> By C. J. S. BETHUNE.....	169
<i>Bibliography of Canadian Botany for the year 1915.</i> By A. H. MACKAY.....	189
<i>Bibliography of Canadian Zoology for the year 1915.</i> By E. M. WALKER.....	201



THE ROYAL SOCIETY OF CANADA

FOUNDER: HIS GRACE THE DUKE OF ARGYLL, K.T., &c.

(WHEN GOVERNOR-GENERAL OF CANADA IN 1882)

OFFICERS FOR 1916-1917

HONORARY PRESIDENT:

HIS ROYAL HIGHNESS THE DUKE OF CONNAUGHT, K.G.,
&c., &c.

PRESIDENT—A. B. MACALLUM, Ph.D., F.R.S.

VICE-PRESIDENT—HON. MR. JUSTICE LONGLEY, LL.D.

HONORARY SECRETARY.....DUNCAN C. SCOTT.

HONORARY TREASURER.....C. GORDON HEWITT, D.Sc.

HONORARY LIBRARIAN.....D. B. DOWLING, B.Sc.

OFFICERS OF SECTIONS:

SEC. I.—Littérature Française, Histoire, Archéologie, Sociologie, Economie Politique et sujets connexes

PRESIDENT.....A.-D. DECELLES, C.M.G., LL.D.

VICE-PRESIDENT.....HON. L. O. DAVID.

SECRETARY.....LOUVIGNY DE MONTIGNY.

SEC. II.—English Literature, History, Archæology, Sociology, Political Economy and Allied Subjects

PRESIDENT.....PROF. GEO. M. WRONG, M.A.

VICE-PRESIDENT.....MAURICE HUTTON, M.A., LL.D.

SECRETARY.....LAWRENCE J. BURPEE.

SEC. III.—Mathematical, Physical and Chemical Sciences

PRESIDENT.....R. F. RUTTAN, M.D., C.M., D.Sc.

VICE-PRESIDENT.....A. S. EVE, D.Sc.

SECRETARY.....F. T. SHUTT, M.A., D.Sc.

SEC. IV.—Geological and Biological Sciences

PRESIDENT.....J. P. McMURRICH, M.A., Ph.D.

VICE-PRESIDENT.....R. G. McCONNELL, B.A.

SECRETARY.....J. J. MACKENZIE, B.A., M.B.

ADDITIONAL MEMBERS OF COUNCIL:

SIR JAMES GRANT, K.C.M.G.

SIR ADOLPHE B. ROUTHIER.

ALFRED BAKER, M.A., LL.D.

BENJAMIN SULTE, LL.D.

LAWRENCE M. LAMBE, F.G.S.

FRANK D. ADAMS, Ph.D., F.R.S., F.G.S.

THE ROYAL SOCIETY OF CANADA

LIST OF MEMBERS, 1916-1917

The date given is the date of election; c, denotes a charter member.

SECTION I.—LITTÉRATURE FRANÇAISE, HISTOIRE, ARCHÉOLOGIE, SOCIOLOGIE, ETC.

- 1916—BARBEAU, C.-M., LL.L., B.Sc. (Oxon.), Geological Survey, *Ottawa*.
c—BÉGIN, S. E. LE CARDINAL L.-N., archevêque de Québec, docteur en théologie, *Québec*.
- 1905—BRUCHÉSI, S. G. MGR PAUL, archevêque de Montréal, docteur en théologie, *Montréal*.
- 1902—CHAPPAIS, THOMAS, membre du Conseil législatif, docteur ès lettres, chevalier de la Légion d'honneur, *Québec*.
- 1916—CHARTIER, L'ABBÉ EMILE, Ph.D. (Romain), Litt. Lic. (Paris), M.A. (Laval), Professeur à l'Université Laval, *Montréal*.
- 1914—CHOQUETTE, ERNEST, membre du Conseil législatif, *Saint-Hilaire*.
- 1890—DAVID, L.-O., sénateur, chevalier de la Légion d'honneur, *Montréal*.
- 1885—DE CELLES, A.-D., C.M.G., LL.D., docteur ès lettres, chevalier de la Légion d'honneur, *Ottawa*.
- 1915—GARNEAU, HECTOR, LL.B., bachelier en droit, professeur à l'Ecole d'Enseignement Supérieure de Montréal, *Montréal*.
- 1898—GÉRIN, LÉON, *Coaticook*.
- 1911—GOSSELIN, MONSIGNOR AMÉDÉE-E., recteur de l'Université Laval, maître ès arts, *Québec*.
- 1892—GOSSELIN, L'ABBÉ AUGUSTE, docteur ès lettres, *Saint-Charles-de-Bellechasse*.
c—LE MAY, PAMPHILE, docteur ès lettres, *Saint-Jean-Deschaillons, près Québec*.
- 1908—LEMIEUX, RODOLPHE, membre du Conseil privé du Canada, docteur en droit, officier de la Légion d'honneur, *Ottawa*.
- 1911—LOZEAU, ALBERT, officier d'Académie, *Montréal*.
- 1908—MIGNAULT, PIERRE-BASILE, C.R., docteur en droit, *Montréal*.
- 1913—MONTIGNY, LOUVIGNY TESTARD DE, officier de l'Instruction publique, *Ottawa*.
- 1914—MONTPETIT, EDOUARD, LL.L., diplômé de l'Ecole des Sciences politiques de Paris, officier de l'Instruction publique, *Montréal*.
- 1916—MORIN, VICTOR, B.A., LL.D., *Montréal*.
- 1909—MYRAND, ERNEST, docteur ès lettres, *Québec*.
- 1903—PAQUET, MONSIGNOR LOUIS-AD., docteur en théologie, *Québec*.
- 1899—POIRIER, PASCAL, sénateur, chevalier de la Légion d'honneur, *Shédiac*.
- 1903—PRUD'HOMME, L.-A., juge, *Saint-Boniface*.
- 1908—RIVARD, ADJUTOR, maître ès arts, docteur ès lettres, *Québec*.
- 1915—ROUILLARD, EUGENE, Bachelier en droit de l'Université Laval, officier d'Académie, *Québec*.
c—ROUTHIER, SIR ADOLPHE-B., C.G.C. Saint-Grégoire, docteur en droit et ès lettres, ancien président général, *Québec*.
- 1904—ROY, L'ABBÉ CAMILLE, docteur ès lettres, licencié ès lettres de l'Université de Paris, *Québec*.
- 1911—ROY, PIERRE-GEORGES, docteur ès lettres, officier de l'Instruction Publique, *Lévis*.
c—SULTE, BENJAMIN, LL.D., docteur ès lettres, ancien président général, *Ottawa*.

SECTION II.—ENGLISH LITERATURE, HISTORY, ARCHÆOLOGY,
SOCIOLOGY, ETC.

- 1901—BRYCE, REV. GEORGE, M.A., LL.D., *Winnipeg* (ex-president).
 1911—BURPEE, LAWRENCE, J., F.R.G.S., Sec'y. International Joint Commission, *Ottawa*.
 1894—CAMPBELL, W. WILFRED, LL.D., Dominion Archives, *Ottawa*.
 1906—COYNE, J. H., M.A., LL.D., *St. Thomas*.
 1906—CRUIKSHANK, COL. E. A., *Calgary*.
 c—DENISON, COL. G. T., B.C.L., *Toronto* (ex-president; life member).
 1905—DOUGHTY, ARTHUR, G., C.M.G., Litt. D., Dominion Archivist, *Ottawa*.
 1915—EDGAR, PELHAM, Ph.D., Victoria College, *Toronto*.
 1916—FALCONER, ROBERT A., C.M.G., LL.D., D.Litt., President University of *Toronto, Toronto*.
 1911—GRANT, W. LAWSON, M.A. (Oxon), Queen's University, *Kingston*.
 1913—HILL-TOUT, CHARLES, *Abbotsford, B.C.*
 1913—HUTTON, MAURICE, M.A., LL.D., University of Toronto, *Toronto*.
 1905—JAMES, C. C., C.M.G., LL.D., 144 St. George St., *Toronto*. (Life member).
 1910—JONES, REV. ARTHUR E., S.J., LL.D., St. Mary's College, *Montreal*.
 1910—KING, HON. W. L. MACKENZIE, C.M.G., Ph.D., *Ottawa*.
 1913—LEACOCK, STEPHEN, B.A., Ph.D., McGill University, *Montreal*.
 1903—LESUEUR, W. D., B.A., LL.D., *Ottawa* (ex-president).
 1902—LIGHTHALL, WILLIAM DOUW, M.A., B.C.L., F.R.S.L., *Montreal*.
 1898—LONGLEY, HON. MR. JUSTICE, LL.D., *Halifax*.
 1916—MACMECHAN, ARCHIBALD, B.A., Ph.D., Dalhousie University, *Halifax*.
 1910—MACPHAIL, ANDREW, B.A., M.D., *Montreal*.
 1914—MAVOR, JAMES, Ph.D., University of Toronto, *Toronto*.
 1911—McLACHLAN, R. WALLACE, F.R.N.S., *Westmount*.
 1914—PETERSON, SIR WILLIAM, K.C.M.G., LL.D., Principal McGill University, *Montreal*.
 1913—PHILLIPPS-WOLLEY, SIR CLIVE, Kt., F.R.G.S., *Somenos, B.C.*
 1906—RAYMOND, VEN. ARCHDEACON W. O., LL.D., *St. John*.
 1914—ROBERTSON, J. ROSS, *Toronto*.
 1899—SCOTT, D. CAMPBELL, Deputy Superintendent General of Indian Affairs, *Ottawa*.
 1900—SCOTT, REV. FREDERICK GEORGE, C.M.G., *Quebec*.
 1906—SHORTT, ADAM, C.M.G., M.A., LL.D., *Ottawa*.
 1916—SKELTON, OSCAR D., M.A., Ph.D., Queen's University, *Kingston*.
 1910—THOMSON, E. W., F.R.S.L., *Ottawa*.
 1911—WALKER, SIR EDMUND, C.V.O., *Toronto*.
 1905—WOOD, LT.-COL. WILLIAM, *Quebec*.
 1908—WRONG, GEORGE M., M.A., University of Toronto, *Toronto*.

SECTION III.—MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

- 1914—ALLAN, FRANCIS BARCLAY, M.A., Ph.D., University of Toronto, *Toronto*.
 1909—ALLEN, PROFESSOR FRANK, M.A., Ph.D., University of Manitoba, *Winnipeg*.
 1915—BAIN, JAMES WATSON, B.A. Sc., University of Toronto, *Toronto*.
 1899—BAKER, ALFRED, M.A., LL.D., (ex-president) University of Toronto, *Toronto*.
 1902—BARNES, H. T., D.Sc., F.R.S., McGill University, *Montreal*. (Life member).
 1916—BRONSON, HOWARD L., B.A., Ph.D., Dalhousie University, *Halifax*.

- 1913—BURTON, E. FRANKLIN, B.A., Ph.D., University of Toronto, *Toronto*.
 1915—CLARK, A. L., B.Sc., Ph.D., Queen's University, *Kingston*.
 1897—DAWSON, W. BELL, M.A., Ma.E., D.Sc., M. Inst. C.E., *Ottawa*.
 c—DEVILLE, E., LL.D., I.S.O., Surveyor-General, *Ottawa*.
 c—DUPUIS, N. F., M.A., F.R.S.E., Queen's University, *Kingston*.
 1891—ELLIS, W. H., M.D., University of Toronto, *Toronto*.
 1910—EVE, A. S., D.Sc., McGill University, *Montreal*.
 1909—FIELDS, JOHN CHARLES, Ph.D., F.R.S., University of Toronto, *Toronto*.
 c—GIRDWOOD, G. P., M.D., McGill University, *Montreal*. (Life member).
 1902—GLASHAN, J. C., LL.D., *Ottawa*.
 1891—GOODWIN, W. L., D.Sc., Queen's University, *Kingston*.
 1908—HARKNESS, JAMES, M. A. (Cantab. & Lond.). McGill University, *Montreal*.
 1911—HERDT, LOUIS A., D.Sc., E.E., McGill University, *Montreal*.
 c—HOFFMANN, G. C., F.I.C., M.M.S., LL.D., *Ottawa*.
 1914—JOHNSON, F. M. G., M.Sc., Ph.D., F.I.C., McGill University, *Montreal*.
 1911—KENRICK, FRANK B., M.A., Ph.D., University of Toronto, *Toronto*. (Life member).
 1915—KING, LOUIS VESSOT, M.A. (Cantab.), D.Sc., McGill University, *Montreal*.
 1910—KLOTZ, OTTO, LL.D., F.R.A.S., Dominion Observatory, *Ottawa*.
 1911—LANG, WILLIAM R., D.Sc., F.I.C., University of Toronto, *Toronto*.
 c—LOUDON, JAMES, M.A., LL.D., *Toronto* (ex-president).
 1913—MACKENZIE, A. STANLEY, B.A., Ph.D., D.C.L., Dalhousie University, *Halifax*.
 1900—MCGILL, ANTHONY, B.Sc., LL.D., Chief Analyst, *Ottawa*.
 1909—MCINTOSH, DOUGLAS, Ph.D., University of British Columbia, *Vancouver, B.C.*
 1903—MCLENNAN, J. C., Ph.D., University of Toronto, *Toronto*.
 1893—MCLEOD, C. H., M.E., McGill University, *Montreal*. (Life member).
 1911—MCCLUNG, ROBERT K., M.A., D.Sc., B.A. (Cantab.), University of Manitoba, *Winnipeg*.
 1899—MILLER, W. LASH, Ph.D., University of Toronto, *Toronto*. (Life member).
 1910—PLASKETT, J. S., B.A., D.Sc., Dominion Observatory, *Ottawa*.
 1896—RUTTAN, R. F., M.D., C.M., D.Sc., McGill University, *Montreal*.
 1899—SHUTT, F. T., M.A., D.Sc., F.I.C., F.C.S., Chemist, Central Experimental Farm, *Ottawa*. (Life member).
 1913—STANSFIELD, ALFRED, D.Sc., A.R.S.M., McGill University, *Montreal*.
 1901—STUPART, SIR ROBERT F., Kt., Superintendent Meteorological Service, *Toronto*.
 1909—TORY, H. M., M.A., D.Sc., LL.D., *Edmonton*.

SECTION IV—GEOLOGICAL AND BIOLOGICAL SCIENCES

- 1902—ADAMI, J. G., F.R.S., M.A., M.D. (Cantab. and McGill), LL.D., F.R.S.E., McGill University, *Montreal*.
 1896—ADAMS, FRANK D., Ph.D., D.Sc., F.R.S., F.G.S., McGill University, *Montreal*. (ex-president).
 1900—AMI, HENRY M., M.A., D.Sc., F.G.S., *Ottawa*. (Life member).
 c—BAILEY, L. W., M.A., Ph.D., University of New Brunswick, *Fredericton*.
 c—BELL, ROBERT, B.Ap.Sc., M.D., LL.D., F.G.S., F.R.S., *Ottawa*.
 1910—BENSLEY, BENJ. A., Ph.D., University of Toronto, *Toronto*.
 1892—BETHUNE, REV. C. J. S., M.A., D.C.L., *Guelph*. (Life member).
 1911—BROCK, REGINALD W., M.A., F.G.S., F.G.S.A., University of British Columbia *Vancouver, B.C.*

- 1911—BRODIE, T. G., M.D., F.R.S., University of Toronto, *Toronto*.
 1909—BULLER, A. H. REGINALD, D.Sc., Ph.D., University of Manitoba, *Winnipeg*.
 1885—BURGESS, T. J. W., M.D., *Montreal*. (Life member).
 1900—COLEMAN, A. P., M.A., Ph.D., F.R.S., University of Toronto, *Toronto*.
 1912—DOWLING, D. B., B.Sc., Geological Survey, *Ottawa*.
 1915—DRESSER, JOHN A., M.A., *Montreal, Que.*
 1913—FARIBAUT, E. RODOLPHE, B.Ap.Sc., Geological Survey, *Ottawa*.
 1912—FAULL, J. H., B.A., Ph.D., University of Toronto, *Toronto*.
 1916—FRASER, C. MCLEAN, M.A., Ph.D., Biological Station, *Nanaimo, B.C.*
 c—GRANT, SIR J. A., K.C.M.G., M.D., F.G.S., *Ottawa* (ex-president).
 1916—HARRIS, D. FRASER, M.D., D.Sc., F.R.S.E., Dalhousie University, *Halifax*.
 1910—HARRISON, FRANCIS C., B.S.A., D.Sc., Macdonald College, *Ste. Anne de Bellevue, Que.*
 1913—HEWITT, C. GORDON, D.Sc., F.E.S., Dominion Entomologist, *Ottawa*.
 1916—HUNTER, ANDREW, M.A., B.Sc., M.B., Ch.B. Edin., University of Toronto, *Toronto*.
 1913—HUARD, L'ABBÉ VICTOR A., D.D., *Quebec*.
 1912—KNIGHT, A. P., M.A., M.D., Queen's University, *Kingston*.
 1901—LAMBE, LAWRENCE M., F.G.S., Geological Survey, *Ottawa*. (Life member).
 1916—LLOYD, FRANCIS E., M.A., McGill University, *Montreal*.
 1900—MACALLUM, A. B., Ph.D., F.R.S., University of Toronto, *Toronto*.
 1888—MACKAY, A. H., LL.D., B.Sc., Superintendent of Education, *Halifax*. (Life member).
 1909—MACKENZIE, J. J., B.A., M.B., University of Toronto, *Toronto*.
 1913—MCCONNELL, RICHARD G., B.A., Deputy Minister of Mines, *Ottawa*.
 1912—MCINNES, WILLIAM, B.A., Geological Survey, *Ottawa*. (Life member).
 1909—MCMURRICH, J. P., M.A., Ph.D., University of Toronto, *Toronto*.
 1915—MCPHEDRAN, ALEXANDER, M.B., University of Toronto, *Toronto*.
 c—MATTHEW, G. F., M.A., D.Sc., *St. John, N.B.*, (Life member).
 1911—MILLER, WILLET G., B.A., LL.D., F.G.S.A., *Toronto*. (Life member).
 1913—MOORE, CLARENCE L., M.A., Dalhousie University, *Halifax*.
 1908—NICHOLLS, A. G., M.A., M.D., D.Sc., Dalhousie University, *Halifax, N.S.*
 1915—PARKS, WILLIAM ARTHUR, B.A., Ph.D., University of Toronto, *Toronto*.
 1902—PRINCE, E. E., B.A., LL.D., F.L.S., Dominion Commissioner of Fisheries, *Ottawa*. (Life member).
 1914—RODDICK, SIR THOS. G., Kt., M.D., C.M., McGill University, *Montreal*.
 1910—TYRRELL, JOSEPH B., M.A., B.Sc., F.G.S., *Toronto*. (Life member).
 1909—VINCENT, SWALE, M.D., D.Sc., University of Manitoba, *Winnipeg*.
 1915—WALKER, EDMUND MURTON, B.A., M.B., University of Toronto, *Toronto*.
 1910—WHITE, JAMES, F.R.G.S., Assistant to Chairman, and Secretary, Commission of Conservation, *Ottawa*.
 1912—WILLEY, ARTHUR, D.Sc., F.R.S., McGill University, *Montreal*.

CORRESPONDING MEMBERS

SECTION I

- SALONE, EMILE, professeur d'histoire au Lycée Condorcet, 68 rue Jouffray, *Paris*.
 HANOTAUX, GABRIEL, de l'Académie française, 21 rue Cassette, *Paris*.
 LAMY, ETIENNE, secrétaire perpétuel de l'Académie française 3 place d'Iéna, *Paris*.
 LORIN, HENRI, professeur d'histoire coloniale à l'Université de Bordeaux, 23, quai des Chartrons, *Bordeaux*.

SECTION II

- BRYCE, RT. HON. VISCOUNT, D.C.L., *London, England.*
 GANONG, DR. W. F., *Northampton, Mass.*
 PARKER, SIR GILBERT, Bart., D.C.L., M.P., P.C., *London, England.*
 SIEBERT, WILBUR H., A.B., A.M., Ohio State University, *Columbus, Ohio.*

SECTION III

- BONNEY, T. G., D.Sc., LL.D., F.R.S., *London, England.*
 METZLER, W. H., Ph.D., F.R.S., Edin., Syracuse University, *Syracuse, N.Y.*
 OSTWALD, PROF. DR., WILHEM, *Leipzig.*
 THOMSON, SIR JOSEPH J., O.M., F.R.S., *Cambridge, England.*

SECTION IV

- OSBORN, DR. HENRY FAIRFIELD, Columbia University, *New York, N.Y.*
 WHITE, CHARLES DAVID, B.Sc., United States Geological Survey, *Washington D.C.*

RETIRED MEMBERS

- c—BOURASSA, NAPOLÉON, *Montreal.*
 1902—BURWASH, REV. NATHANAEL, S.T.D., LL.D., Victoria College, *Toronto.*
 1895—CALLENDAR, HUGH L., M.A. (Cantab.), F.R.S., *London, England.*
 1899—CHARLAND, PERE PAUL V., Litt. D., *Quebec.*
 1909—COLBY, CHAS. W., M.A., McGill University, *Montreal.*
 1897—COX, JOHN, M.A., (Cantab.), *London, England.*
 1891—FOWLER, JAMES, M.A., Queen's University, *Kingston.*
 1904—GORDON, REV. CHARLES W., LL.D., *Winnipeg.*
 c—HAANEL, E., Ph.D., Director of Mines, *Ottawa.*
 1894—HARRINGTON, W. H., *Ottawa.*
 1911—LEATHES, JOHN B., B.A., F.R.C.S., B.Ch. (Oxon.), *Sheffield, England.*
 1909—MACBRIDE, ERNEST W., M.A., F.R.S., *London, England.*
 1889—MAIR, CHARLES, Prince Albert, *Sask.*
 1890—MILLS, T. WESLEY, 45 Warrington Crescent, Maida Vale, *London, England.*
 c—MURRAY, REV. J. CLARK, LL.D., *Montreal.*
 c—OSLER, SIR W., BT., M.D., F.R.C.P., F.R.S., *Oxford, England.*
 1902—OWENS, R. B., M.Sc., Franklin Institute, *Philadelphia, U.S.*
 1898—PARKIN, G. R., C.M.G., LL.D., *London, England.*
 1900—POOLE, H. S., M.A., F.G.S., *Spreyton, Stoke, Guildford, England.*
 c—READE, JOHN, LL.D., F.R.S.L., *Montreal.*
 1890—ROBERTS, C. G. D., M.A., *London, England.*
 1900—RUTHERFORD, E., B.A., (Cantab.), A.M., F.R.S., *Manchester, England.*
 c—WATSON, J., M.A., LL.D., *Kingston.*
 1900—WILLISON, SIR JOHN S., LL.D., *Toronto.*
 1910—WILSON, HAROLD A., F.R.S., *Houston, Texas.*
 c—WRIGHT, R. RAMSAY, M.A., B.Sc., *Bournemouth, England (ex-president).*

LIST OF PRESIDENTS

1882-1883.....	SIR J. W. DAWSON.
1883-1884.....	L'HONORABLE P. J. O. CHAUVEAU.
1884-1885.....	DR. T. STERRY HUNT.
1885-1886.....	SIR DANIEL WILSON.
1886-1887.....	MONSIGNOR HAMEL.
1887-1888.....	DR. G. LAWSON.
1888-1889.....	SIR SANDFORD FLEMING, K.C.M.G.
1889-1890.....	L'ABBÉ CASGRAIN.
1890-1891.....	VERY REV. PRINCIPAL GRANT.
1891-1892.....	L'ABBÉ LAFLAMME.
1892-1893.....	SIR J. G. BOURINOT, K.C.M.G.
1893-1894.....	DR. G. M. DAWSON, C.M.G.
1894-1895.....	SIR J. MACPHERSON LEMOINE.
1895-1896.....	DR. A. R. C. SELWYN, C.M.G.
1896-1897.....	MOST REV. ARCHBISHOP O'BRIEN.
1897-1898.....	L'HONORABLE F. G. MARCHAND.
1898-1899.....	T. C. KEEFER, C.M.G.
1899-1900.....	REV. WILLIAM CLARK, D.C.L.
1900-1901.....	L. FRÉCHETTE, C.M.G., LL.D.
1901-1902.....	JAMES LOUDON, LL.D.
1902-1903.....	SIR J. A. GRANT, M.D., K.C.M.C.
1903-1904.....	COL. G. T. DENISON, B.C.L.
1904-1905.....	BENJAMIN SULTE, LL.D.
1905-1906.....	DR. ALEX. JOHNSON.
1906-1907.....	DR. WM. SAUNDERS, C.M.G.
1907-1908.....	DR. S. E. DAWSON, C.M.G.
1908-1909.....	DR. J. EDMOND ROY.
1909-1910.....	REV. GEO. BRYCE, LL.D.
1910-1911.....	R. RAMSAY WRIGHT, M.A., B.Sc.
1911-1912.....	W. F. KING, LL.D., C.M.G.
1912-1913.....	W. DAWSON LESUEUR, B.A., LL.D.
1913-1914.....	FRANK D. ADAMS, Ph.D., F.R.S., F.G.S.
1914-1915.....	SIR ADOLPHE B. ROUTHIER.
1915-1916.....	ALFRED BAKER, M.A., LL.D.
1916-1917.....	A. B. MACALLUM, Ph.D., F.R.S.

LIST OF ASSOCIATED SOCIETIES

ONTARIO

Hamilton Association for the Promotion of Science, Literature and Art.
The Wellington Field Naturalists' Society.
The Hamilton Scientific Society.
L'Institut Canadien-Français d'Ottawa.
The Women's Wentworth Historical Society.
The Entomological Society of Ontario.
L'Institut Canadien d'Ottawa.
Women's Canadian Historical Society of Ottawa.
Elgin Historical and Scientific Institute.
Women's Auxiliary of the Elgin Historical and Scientific Institute.
Ontario Historical Society.
The Huron Institute.
Niagara Historical Society.
The Ottawa Field Naturalists' Club.
Royal Astronomical Society of Canada.
Canadian Institute, Toronto.
Historical Society, Kingston.
Toronto Astronomical Society.
Lundy's Lane Historical Society.
Women's Canadian Historical Society of Toronto.
United Empire Loyalists Association of Canada.
Peterborough Historical Society.
Canadian Forestry Association.
Hamilton Ladies' College Alumnae.
Club Littéraire Canadien-Français d'Ottawa.
The Historic Landmarks Association of Canada.
Waterloo Historical Society.

QUEBEC

Société du Parler Français au Canada, Québec.
Société de Géographie de Québec.
Société d'Economie Sociale et Politique de Québec.
The Quebec Society for the Protection of Plants from Insects and
Fungus Diseases.
The Antiquarian and Numismatic Society of Montreal.

L'Institut Canadien de Québec.
Natural History Society of Montreal.
Microscopical Society, Montreal.
Société Historique, Montréal.
Cercle Littéraire et Musical de Montréal.
Literary and Historical Society, Quebec.

BRITISH COLUMBIA

The Natural History Society of British Columbia.
The British Columbia Academy of Science.

NOVA SCOTIA

The Nova Scotia Historical Society.
The Nova Scotian Institute of Science.

MANITOBA

Manitoba Historical and Scientific Society.

NEW BRUNSWICK

New Brunswick Historical Society.
New Brunswick Loyalists' Society.
Natural History Association.
Natural History Society of New Brunswick.

PRINCE EDWARD ISLAND

Natural History and Antiquarian Society of Prince Edward Island.



THE ROYAL SOCIETY OF CANADA

PROCEEDINGS FOR 1916

THIRTY-FIFTH GENERAL MEETING

SESSION I.—(Tuesday, May 16)

The Royal Society of Canada held its thirty-fifth annual meeting in the Chateau Laurier, on May 16, 17, and 18. The Presidential Address and the Popular Lecture were delivered in the Concert Hall.

The President, Dr. Alfred Baker, took the chair at 10 a.m., and, having called the meeting to order, requested the Honorary Secretary to call the roll.

The following members answered to their names or arrived later during the session:—

OFFICERS OF THE SOCIETY

President, Dr. Alfred Baker.

Honorary Secretary, Mr. Duncan C. Scott.

Honorary Treasurer, Dr. C. Gordon Hewitt.

Honorary Librarian, Mr. D. B. Dowling.

SECTION I.—Barbeau, C.-M.; Bruchési, Mgr Paul; Chartier, Emile; Choquette, Ernest; David, Hon. L. O.; DeCelles, A. D.; Gérin, Léon; Gosselin, Auguste; Lemieux, Hon. Rodolphe; Mignault, P. B.; Montigny, L. T. de; Morin, Victor; Myrand, Ernest; Poirier, Pascal; Rouillard, Eugene; Sulte, Benjamin.

SECTION II.—Bryce, George; Burpee, L. J.; Campbell, Wilfred; Coyne, J. H.; Hutton, Maurice; King, W. L. MacKenzie; LeSueur, W. D.; Lighthall, W. D.; Longley, J. W.; McLachlan, R. W.; Peterson, Sir William; Scott, D. C.; Shortt, Adam; Skelton, Oscar D.; Thomson, E. W.

SECTION III.—Baker, Alfred; Barnes, H. T.; Bronson, H. L.; Dawson, W. Bell; Deville, E.; Ellis, W. H.; Glashan, J. C.; Goodwin, W. L.; Harkness, James; Hoffmann, G. C.; King, L. V.; Klotz, Otto; MacKenzie, A. Stanley; McClung, R. K.; McGill, Anthony; McLennan, J. C.; McLeod, C. H.; Plaskett, J. S.; Ruttan, R. F.; Shutt, F. T.; Stansfield, Alfred.

Section IV.—Adams, Frank D.; Bailey, L. W.; Bensley, Benj. A.; Bethune, C. J. S.; Brodie, T. G.; Buller, A. H. R.; Coleman, A. P.; Dowling, D. B.; Dresser, John A.; Faribault, E. R.; Faull, J. H.; Grant, Sir James; Harris, D. F.; Harrison, F. C.; Hewitt, C. Gordon; Hunter, Andrew; Huard, Victor A.; Lambe, Lawrence M.; Lloyd, F. E.; Macallum, A. B.; MacKay, A. H.; McConnell, R. G.; McInnes, William; McMurrich, J. P.; Matthew, G. F.; Moore, Clarence, L.; Parks, W. A.; Prince, E. E.; Tyrrell, J. B.; White, James.

Letters of regret for absence were received from: Miller, W. G.; Jones, A. E.; Wrong, G. M.; Hill-Tout, C.; Burgess, T. J. W.; Paquet, L. A.; Gosselin, A. E.; MacMechan, Archibald; Fraser, C. McLean; Leacock, Stephen; Roy, Camille; Nicholls, A. G.; Clark, A. L.; Falconer, R. A.; Roddick, T. G., Denison, G. T.; Mavor, James; Montpetit, E.; Rivard, A.; Wood, William; Raymond, W. O.; Ami, H. M.;

It was moved by Mr. Lighthall, seconded by Dr. Coyne that all Fellows on active military service, either at home or abroad, be considered present.—Carried.

The following Fellows are reported as being on active service:—

Rev. F. G. Scott, C.M.G.; Rev. Dr. Charles W. Gordon; Dr. Andrew Macphail; Prof. W. Lawson Grant; Dr. A. G. Doughty, C.M.G.; Col. E. A. Cruikshank; Lt.-Col. William Wood; Dr. Pelham Edgar; Dr. W. R. Lang; Lt.-Col. J. G. Adami; R. W. Brock, F.G.S.; Dr. T. G. Brodie; Dr. J. J. MacKenzie and Dr. A. G. Nicholls.

It was moved by Dr. Macallum, seconded by Dr. Prince, that the minutes of the annual meeting of last year, as contained in the printed proceedings of last year in the hands of the members, be confirmed.—Carried.

The Annual Report of Council, printed copies of which had been delivered to the members, was then presented by the Honorary Secretary. The Report was as follows:—

REPORT OF COUNCIL

FOR THE YEAR 1915-1916

To the Fellows of The Royal Society of Canada,

The Council have the honour to present the following report on the work of the Society during the past year:

The last Annual Meeting was held in Ottawa in the Chateau Laurier. The meeting was a most successful one, and the accommoda-

tion which was given the Society by the management of the Chateau rendered the meeting thoroughly enjoyable. We have been able to make like arrangements for this year's meeting. We have not transacted as much business during this year as usual, owing to the continuance of the war, which absorbs so much of our energy and interest.

I.—PROCEEDINGS AND TRANSACTIONS OF THE SOCIETY

The usual four quarterlies of Volume IX have been distributed during the year and a bound copy of the volume is laid upon the table for inspection. The issue will soon be ready for distribution.

The volume consists this year of 1,306 pages, an increase of 149 pages over last year's, with many illustrations. The number of reprints supplied gratuitously to authors this year was 6,900. The reports of twenty Associated Societies appear in the printed Proceedings.

The agenda this year shows about the same number of papers as last year, implying a continuance of the interest of the Fellows in the work of the Society.

II.—ELECTION OF NEW MEMBERS

This year there were vacancies in all the Sections and as usual the voting was closed on the 1st April. The Council have much pleasure in reporting that the following candidates received a majority of the votes cast and their election is submitted for confirmation.

SECTION I

M. C.-Marius Barbeau, LL.L., B.Sc.
L'Abbé Emile Chartier, Ph.D., Litt. Lic., M.A.
M. Victor Morin, B.A., LL.D.

SECTION II

Robert A. Falconer, C.M.G., LL.D., D.Litt.
Archibald MacMechan, B.A., Ph.D.
Oscar D. Skelton, M.A., Ph.D.

SECTION III

Howard Logan Bronson, B.A., Ph.D.

SECTION IV

C. McLean Fraser, M.A., Ph.D.

D. Fraser Harris, M.D., D.Sc., F.R.S.E.

Andrew Hunter, M.A., B.Sc., M.B.

Francis E. Lloyd, M.A.

III.—DECEASED MEMBERS

It is with deep regret that we record four vacancies in the ranks of the Fellows, which have occurred by death: Dr. Ernest Gagnon, Dr. Samuel E. Dawson, Sir Sandford Fleming, and Dr. W. F. King.

Biographical notices of the deceased Fellows appear herewith.

The notice of Dr. Gagnon was written by Hon. Thomas Chapais; the Honorary Secretary contributed the notice of Dr. Dawson; Mr. Lawrence J. Burpee that of Sir Sandford Fleming; and Dr. J. S. Plaskett has contributed the notice of Dr. W. F. King.

ERNEST GAGNON

Monsieur Frédéric-Ernest-Amédée Gagnon naquit à la Rivière-du-Loup—aujourd'hui Louiseville—dans le district des Trois-Rivières, le 7 novembre 1834.

Son père, Monsieur Charles-Edouard Gagnon, né en 1800, était notaire, et faisait honneur à sa profession. Nous lisons à son sujet dans une petite brochure intime qui contient beaucoup d'intéressants détails biographiques et généalogiques: "Il rédigeait ses actes avec clarté, et savait manier avec élégance les archaïsmes du bon vieux droit français. Il s'appliquait à régler les différends entre ceux qui s'adressaient à lui dans leurs contentions, et ne leur conseillait que bien rarement de recourir aux tribunaux pour obtenir justice. Il s'exprimait correctement, grammaticalement, mais sans la moindre affectation. Il possédait aussi la langue anglaise, et la parlait sans efforts. Il aimait singulièrement la poésie et la musique." Evidemment l'atavisme n'est pas un vain mot.

Monsieur Charles-Edouard Gagnon avait épousé à Blairfindie (l'Acadie), le 20 juin 1826, Mademoiselle Julie-Jeanne Durand, fille de Marin-François Durand, propriétaire foncier, sous-collecteur des douanes à Plattsburgh, et de Bernardine Sailly.

La lignée paternelle de M. Ernest Gagnon était l'une des plus anciennes du Canada. Il descendait directement de Mathurin Gagnon, qui, avec ses deux frères, Jean et Pierre, était venu de Tourouvre, dans la Perche, avant 1640, s'établir au Château-Richer, près



ERNEST GAGNON

de Québec. "Il y a plus de deux siècles et demi, a-t-il écrit lui-même dans la notice intime déjà citée, que mon ancêtre paternel, Mathurin Gagnon, vint se fixer en pleine forêt canadienne, sur les bords du fleuve Saint-Laurent, et y fonda une famille d'*habitants*, cultivateurs du sol. Mes ancêtres paternels ont donc connu les vicissitudes des commencements de la colonie et de cette période désignée sous le nom de temps héroïques du Canada." Par sa mère, M. Gagnon touchait encore de plus près à la France. Son aïeul maternel, Marie-François Durand, était né à Caen, en Normandie; et Bernardine Saily, fille de Pierre Marie, "Sieur de Saily," était née à Larzicourt en Champagne. Ce dernier faisait partie du corps des gardes de la reine Marie-Antoinette. Sa femme, Eléonore Caillat, était fille de Jean-Claude Caillat, avocat en Parlement et agent fiscal de la baronnie de Larzicourt. Un portrait de famille la représente à l'âge de vingt ans, dans le costume qu'elle portait au sacre de Louis XVI, à Reims.

Les liens qui rattachaient à la France la famille de M. Gagnon étaient multiples. Sa grand-mère paternelle, en effet, la mère de son père, M. Charles-Edouard Gagnon, était Marie-Reine Rimbault, fille du docteur François Rimbault, chirurgien français, né à Toulon, qui était venu se fixer au Canada et avait pratiqué longtemps sa profession aux Trois-Rivières.

M. Ernest Gagnon était le cinquième enfant de M. Charles-Edouard Gagnon. Ses premières années s'écoulèrent dans son village natal à Louiseville. A l'école primaire de l'endroit il fut un élève assidu et laborieux. Le grand événement de son enfance paraît avoir été l'arrivée d'un piano au logis paternel. Son premier contact avec l'harmonieux instrument le plongea dans l'extase. On le trouva un soir couché sur le tapis, la tête appuyée sur les pédales. Sa vocation artistique se dessinait déjà.

A douze ans il fut envoyé au collège de Joliette, où il fit ses études littéraires. Puis il alla continuer à Montréal des études musicales commencées avec succès. Trois ans plus tard, en 1853, il devenait organiste de l'église Saint-Jean-Baptiste, à Québec. Il n'était âgé que de dix-neuf ans.

Lorsque l'école normale Laval fut fondée, en 1857, il y fut nommé professeur de musique. Dans l'automne de la même année il partait pour la France afin de s'y perfectionner dans l'art vers lequel sa vie semblait définitivement orientée. Dans son livre *Choses d'autrefois*, M. Gagnon nous a donné d'intéressantes réminiscences de son séjour dans la capitale française, en 1857 et 1858. "C'était après la guerre de Crimée, un peu avant la guerre d'Italie; Napoléon III était dans tout l'éclat de son règne; Paris, qu'il avait en partie transformé, était plus que jamais la ville enchantée." Un certain nombre de

Canadiens y étaient alors de passage, entre autres MM. les abbés Thomas-Etienne Hamel, Louis Beaudet et Cyrille Légaré, du séminaire de Québec, MM. George Desbarats, Hector Verret, J. D. Brousseau, Joseph Perrault, et autres. Arthur Buies était à ce moment élève du lycée Saint-Louis. Le jeune musicien, il n'avait que vingt-quatre ans, très studieux et très sédentaire, était presque toujours chez lui, numéro 7 rue Voltaire, et ses compatriotes s'y donnaient souvent rendez-vous. Un des épisodes amusants de son séjour à Paris fut sa visite chez le grand maestro Rossini, en compagnie de son ami monsieur George Desbarats. Il nous l'a raconté lui-même avec une verve charmante.

Monsieur Gagnon eut pour professeur d'harmonie M. Auguste Durand, en même temps qu'il prenait des leçons de piano de MM. Henri Herz et Gorla. Au printemps de 1858 il fit un voyage d'Italie, la patrie des beaux arts, qui lui laissa des souvenirs enchanteurs.

De retour au pays, M. Ernest Gagnon reprit ses fonctions d'organiste à Saint-Jean-Baptiste. En 1864 il allait occuper le même poste à la cathédrale de Québec, où il demeura jusqu'en 1876. Son talent mûri avait pris toute son ampleur, et ses auditeurs survivants de cette époque nous disent encore l'impression profonde que produisait son exécution si brillante, à la fois pleine d'âme et de virtuosité. En 1865 il publia son recueil, *Chansons populaires du Canada*, qui lui conquit une grande réputation. En 1873 il fit en Europe un second voyage, au cours duquel il envoya au *Courrier du Canada*, dont il était devenu le collaborateur régulier, des lettres spirituelles et charmantes, où son talent littéraire s'affirmait brillamment. Elles furent mises en brochure sous le titre de *Lettres de voyage*.

En 1875 M. Gagnon acceptait les fonctions de secrétaire particulier de l'honorable M. de Boucherville, premier ministre de la province de Québec. L'année suivante, il était nommé secrétaire du ministère des travaux publics, et pendant près de trente ans il manifesta, dans l'accomplissement de ses devoirs ardu, la plus parfaite compétence. Au mois de septembre 1905 il prenait une retraite bien méritée.

Monsieur Ernest Gagnon a été le fondateur de l'Académie de musique de Québec. Il était membre correspondant de la Société des Compositeurs de Musique, de Paris, officier de l'Instruction publique de France, licencié du *Dominion College of Music*, docteur-ès-lettres de l'Université Laval. Il avait été élu membre de la Société Royale du Canada en 1903.

Il avait épousé en premières noces mademoiselle Caroline Nault, fille aînée de feu le docteur J. Z. Nault, professeur à l'Université Laval, et en deuxième noces mademoiselle Emma Cimon, fille de

feu M. Hubert Cimon, négociant de la Malbaie (comté de Charlevoix). Deux filles, Blanche et Alice, sont les dernières survivantes de son premier mariage.

Depuis deux ou trois ans la santé de M. Ernest Gagnon avait commencé à décliner. Ses amis voyaient avec tristesse ses forces décroître. Il avait dépassé sa quatre-vingtième année. Le beau et noble vieillard conservait toujours les merveilleuses qualités de son esprit. Mais tout son organisme physique s'affaissait lentement. Il s'éteignit après quelques jours de maladie, le 15 septembre 1915.

Celui dont nous venons de tracer cette rapide et incomplète esquisse biographique fut pour nous un ami bien cher, et nous éprouvons une satisfaction douloureuse à redire l'admiration très vive et l'affection très profonde que nous lui avions vouée. M. Ernest Gagnon, en disparaissant d'au milieu de nous, a laissé un vide difficile à combler. Il occupait une place à part parmi l'élite de nos hommes distingués. Bien peu réunissaient au même degré autant de dons différents. Il fut en même temps l'artiste le plus délicat, et le plus accompli modèle du parfait officier public. Il avait à la fois l'imagination et le jugement, l'enthousiasme et la pondération, le culte de l'idéal et le sens des réalités. Rarement est-il donné de pouvoir admirer un plus heureux équilibre des facultés imaginatives et des facultés rationnelles. Et c'était cette harmonie merveilleuse qui constituait surtout sa supériorité intellectuelle et morale, à laquelle on a rendu un juste hommage devant sa tombe entr'ouverte.

Rien de plus étonnant que la formation et le développement de son esprit. Jeté très jeune dans la vie active et l'exercice de l'art musical, après des études classiques qu'il eût voulu prolonger davantage, et réussit cependant à se donner, à travers d'absorbantes occupations, une instruction générale, qui, par les lectures, par les voyages, par le commerce avec des sommités intellectuelles, finit par devenir une très ample érudition. M. Gagnon, avec son incomparable modestie, eût souri si on l'eût appelé érudit. Et cependant il l'était dans toute la vérité de l'acception. Histoire, poésie, art, critique, il pouvait parler pertinemment de tout, et bien des fois des étrangers de marque sortirent d'une conversation avec lui émerveillés de l'étendue de ses connaissances. Le secret de cette instruction si remarquable, c'était la puissance intuitive dont il était doué. Il avait une aptitude prodigieuse à tout saisir, à tout comprendre et à tout retenir.

Mais l'érudition seule n'eût pas fait de lui ce qu'il a été surtout. Hâtons-nous de nommer sa faculté maîtresse, celle qu'il a possédée plus qu'aucun Canadien peut-être, le goût. M. Gagnon fut l'homme de goût par excellence, goût sûr, éclairé, j'allais dire infaillible. Goût

artistique, goût littéraire, voilà ce qui faisait de lui le meilleur des critiques et le plus sûr des conseillers, nous tenons à lui en rendre ici un reconnaissant témoignage. L'emphase, l'outrance, l'incorrection, l'obscurité, le maniérisme, trouvaient en lui un censeur clairvoyant et sincère. S'il eût voulu se consacrer à la critique littéraire, il eût tenu ici facilement le sceptre dans ce domaine si important de la littérature contemporaine.

Les devoirs officiels de M. Gagnon ne lui ont pas permis d'écrire autant que son inclination l'y eût induit. Cependant, il laisse une œuvre relativement considérable. On a tout dit sur son volume *Chansons populaires du Canada*, que l'on peut appeler, dans son genre, un monument national, et qui a révélé à la France, plus que bien d'autres manifestations peut-être, le fait merveilleux de la survivance française au Canada. Le *Château Saint-Louis*, *Louis Jolliet*, *Pages d'histoire*, *Louis d'Ailleboust* et *Marie-Barbe de Boullongne*, sont des livres d'histoire qui resteront. *Choses d'autrefois* et *Feuilles volantes*, sont pleines d'un charme pénétrant.

Le charme! Il émanait spontanément de cette personnalité aimable, élégante, raffinée, de cette parole vive et spirituelle, de cette urbanité facile et attirante dont la séduction s'exerçait sur tous ceux qui venaient en relations avec cet homme si parfaitement distingué. Ce charme était le reflet non seulement d'un esprit exquis, mais d'un noble cœur et d'une belle âme. Tous ceux qui ont eu le bonheur de connaître intimement notre regretté concitoyen attesteront la vérité de cet hommage. Élévation de pensée, droiture de caractère, délicatesse de sentiment, culte de l'honneur, ils ont pu admirer en lui toutes ces qualités à un degré suréminent. Avons-nous besoin d'ajouter que M. Gagnon était un chrétien admirable, un croyant humble et fidèle, qui a vécu inaltérablement sa foi durant toute sa longue et belle carrière vouée au devoir et à la vertu.

SAMUEL EDWARD DAWSON

The subject of this sketch was born in the City of Halifax on the 1st of June, 1833. He was a son of the Rev. Benjamin Dawson, a native of Prince Edward Island. He removed to Montreal with his father in 1847. He received his education at McCulloch's School in Halifax, and began his business career in Montreal with his father as a member of the firm of B. Dawson and Son, booksellers and stationers. This firm which had a long and honourable career was for some time one of the most important importing and publishing houses in the Dominion.



SAMUEL EDWARD DAWSON

As Mr. Samuel E. Dawson was an excellent business man and filled with desire for public service it was not long before he took a prominent part in the life of Montreal. In 1879 he was one of the founders of the Dominion Bank Note Company, and in 1880 one of the promoters of the Montreal News Company. He was a member of the Council of Arts and Manufactures of the Province of Quebec and was admitted to the Presidency of that body. He was always an omniferous reader and the best part of his education came from the extent of his reading to which he brought an alert and critical mind. Amongst his useful labours for letters his interest in Copyright Legislation must be mentioned. He mastered the subject, and in 1881 he was a delegate to Washington on International Copyright. In 1888 he was elected a Vice-President of the Canadian Copyright League. His labours were so highly esteemed that the Dominion Government thanked him for the service he had rendered at the Washington Congress. When the position of Dominion King's Printer, with the rank of Deputy Minister, became vacant in 1891, Dr. Dawson received the appointment and filled the position with marked efficiency until 1909, when he accepted superannuation and left the Capital to spend his declining days in Montreal. During his years of administration Dr. Dawson carried out many needed reforms, introduced modern machinery and methods, and the efficiency of the Department was greatly improved during his tenure of office.

Amid all his varied business activities Dr. Dawson cherished his love of letters and arts. For some years he was Secretary of the Montreal Art Association. He took a peculiar interest in the question of the Landfall of the early navigators and discoverers, and contributed most valuable papers to the discussions on the voyages of the Cabots. He also wrote an exhaustive work under the title "The St. Lawrence Basin and its Border-Lands," in which he showed an intimate knowledge of the history of exploration in this region.

By those who knew him best it will be conceded that the chief interest of his literary life was poetry, and he kept this interest alive and vigorous until the end of his life. He was a great admirer of Tennyson and a Tennysonian student of reputation, but his admiration of the Laureate did not prevent him from admiring poets of all schools. He was susceptible to the music of verse, and some of his favourite poems were those which depend almost entirely for their effect on beauty of sound and subtleties of rhythm, such as Shelley's lines in "Prometheus Unbound," "Light of Life thy lips enkindle," and the wonderful songs of Swinburne in "Atalanta in Calydon." Still with all this love of pure sound and colour, Dr. Dawson could admire the

works of Shakespeare, and Browning, and other English poets. He was also a warm friend and admirer of Canadian poets.

The unique position which he occupied as a critic of Tennyson is worthy of remark. His "Study of The Princess" called forth a most interesting letter from the author, which will be found published in the "Memoir of Lord Tennyson by his son." The letter is dated the 21st November, 1882. He wrote:

"I thank you for your able and thoughtful essay on 'The Princess.' You have seen amongst other things that if women ever were to play such freaks, the burlesque and the tragic might go hand in hand. . . . Your explanatory notes are very much to the purpose, and I do not object to your finding parallelisms. They must always occur."

The letter contained some highly interesting remarks on Tennyson's method of work.

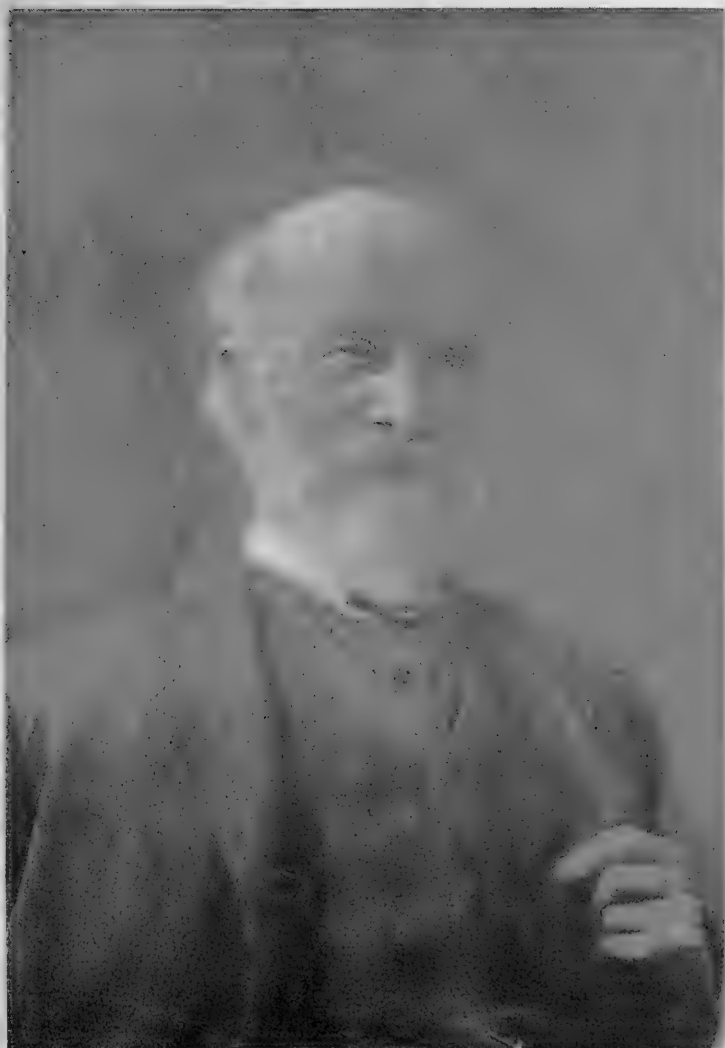
The Laureate says in closing: "I find that I have written, quite contrary to my custom, a letter, when I had merely intended to thank you for your interesting commentary."

Dr. Dawson was granted the C.M.G.; in 1890 Laval University conferred on him a degree of Litt.D.; and he also received an LL.D. from McGill University. From the date of his election to our Society in 1893, until the state of his health would not permit of the continuance of all these activities he gave us most valued support. He contributed to the Transactions of the Society, was Honorary Secretary from 1902 to 1906, and occupied the Presidential chair in 1907-8.

Dr. Dawson's character was of an unusually varied weave; business faculty, intense, unwearied energy, love of precise detail and a stern resolve to get the best and hold to it—these were some of the outstanding forms in the pattern; there was breadth and human sympathy in his life and work. A quaint sense of humour was a mellowing ingredient in his character; it played about his intimate conversation and appeared not seldom in his writings. To those of us who enjoyed his genial friendship memory will often renew the delight of his presence and conversation.

SIR SANDFORD FLEMING

Sandford Fleming, whose death at Halifax on July 22nd, 1915, removed one of the charter members of the Society, was born in the "Lang Toun" of Kirkcaldy, Fifeshire, January 7th, 1827. At the age of eighteen he left Glasgow on the sailing ship *Brilliant*, to make a place for himself in the new world. He landed at Quebec, after a passage of some six weeks, and eleven days later reached Peterboro, by way of Montreal, Ottawa, Kingston and Cobourg. In such leisurely fashion one travelled in 1845.



SIR SANDFORD FLEMING

He had studied surveying in Scotland, and the first years of his life in Canada were devoted to the same profession. In 1851 he joined the staff of the Northern Railway, of which a few years later he became chief engineer. In 1863 he was appointed chief engineer of the Intercolonial Railway surveys. It had been the intention to appoint a board of engineers, one representing Canada, one the Maritime Provinces, and one the Imperial Government, but the various governments paid Mr. Fleming the very high compliment of selecting him as their joint engineer. He remained in charge of the work on the Intercolonial throughout the surveys and the period of construction, until the completion of the road in 1876. Meanwhile he had, in 1871, been appointed by the Dominion Government engineer-in-chief of the surveys for the Canadian Pacific Railway, and remained in charge until 1880, when the work was handed over to a private syndicate. For four years, therefore, Mr. Fleming carried on simultaneously the construction of the Intercolonial, and the surveys for Canada's first transcontinental railway, a gigantic task for one man; and as if this were not enough, he directed during a portion of this time the surveys for the Newfoundland Railway.

It is a well known fact that only very busy professional men can find time for the development of other interests. One is not surprised, therefore, to find Mr. Fleming, in spite of his manifold duties as a railway engineer, devoting a great deal of time and thought to questions of public importance. As early as 1863 he had taken up the cause of the Red River settlers, urging upon both the Canadian and Imperial Governments the importance of furnishing adequate transportation facilities between the Eastern Provinces and Red River. It was also largely due to his enthusiasm and Scottish tenacity that the Canadian Institute was established and granted a royal charter in 1851. In later years he never found himself too engrossed with other affairs to take a lively interest in anything that affected the welfare of the Canadian Institute, and in the published transactions of the society will be found many valuable contributions from his pen.

While engaged in solving the problems of the intercolonial, he had been impressed with the importance of establishing a fast Atlantic steamship service, and repeatedly urged the advantages to Canada of such a project. Possibly his thoughts went back to the circumstances of his first voyage across the Atlantic in 1845. Another matter which he had even more deeply at heart was the organization of a system of state-owned cables connecting all the scattered dominions of the Empire with the Motherland. For years he fought stubbornly for the realization of this great idea, against the powerful opposition of the cable companies, who rightly feared that the establishment of state-

owned cables would compel them to surrender a large percentage of their profits; and against the even more difficult problem of public apathy. He did not live to see the complete development of the "All-Red Line," but he had the satisfaction of seeing the completion of the most important link, the Pacific cable connecting Canada with Australia and New Zealand.

Still another matter which constantly engaged the attention of Sandford Fleming was the question of standard time, and the adoption of a prime meridian. Between 1876 and 1896 he advocated these reforms through every channel that he could command. He addressed societies in America and Europe, issued a score or more of pamphlets dealing with every phase of the question, and carried on a voluminous correspondence with scientific men all over the world. The success with which his efforts were finally crowned is almost equally striking proof of the futility of withstanding any reform which he had determined to carry through, and the extraordinary difficulty in convincing the average civilized man that an obviously cumbersome and illogical system to which he is accustomed should be abandoned in favour of one that has everything to recommend it.

In 1880 Mr. Fleming was elected Chancellor of Queen's University and retained the office up to the time of his death. That he had given to the subject of higher education the same earnest thought that he devoted to every question in which he was interested, is revealed in his well considered addresses to the students of the university. He had not had the advantage of a university education, and probably realized all that he had thereby missed, but he had always been a wide and discriminating reader, and brought to the consideration of educational problems the fruits of a lifetime's experience in many other directions, and his own shrewd common sense. Queen's conferred upon him in 1908 the honorary degree of LL.D. He had already been similarly honored by the University of St. Andrews in 1884, by Columbia University in 1887, and the University of Toronto in 1907.

His eminent services as an engineer, and as a citizen of the Empire, were recognized in 1877 when Her Majesty the Queen created him a C.M.G. Twenty years later he was promoted to a K.C.M.G. He was a Fellow not only of the Royal Society of Canada (President 1888-89), but also of the Royal Geographical Society, the Geological Society, the Royal Historical Society and the Victoria Institute; a member of the Institute of Civil Engineers, the American Society of Civil Engineers, the Canadian Society of Civil Engineers, and many other professional and learned societies in Canada, England, the United States, and the countries of Europe. The list of his writings, extending over the amazing period from 1847 to 1914, fill several pages in the Bibliography appended to his biography.

WILLIAM FREDERICK KING

The Royal Society of Canada has lost one of its most eminent fellows by the death on Easter Sunday, April 23, 1916 of Dr. William Frederick King, C.M.G., the Chief Astronomer of Canada and Director of the Dominion Observatory.

Though a most reticent and unassuming man, Dr. King's sterling qualities and great ability combined with a kindly and lovable disposition had endeared him to a wide circle of friends among the members of the Royal Society and elsewhere, and the news of his death came with a great shock and a sense of personal loss to all who had been associated with him.

The record of his activities and of his services to science and to his country is a long and brilliant one. During his lifetime, besides his scientific work and services, he held many positions of trust and responsibility, representing the Dominion Government in negotiations of great importance with other nations, and these positions were always filled in an eminently satisfactory manner.

He was born at Stowmarket, Suffolk, England, Feb. 19, 1854, and came to Canada with his parents in 1862, settling at Port Hope. He attended the Grammar School at Port Hope matriculating in arts at the University of Toronto in 1869. At the close of his third year he was appointed to a position on the staff of the International Boundary Survey, thus beginning at the age of eighteen what was an important part of his life's work. He returned to the University in December, 1874, and graduated with the degree of B.A. in 1875, with high honours, obtaining the gold medal in mathematics, his standing in the class lists never having been surpassed. Dr. King's mathematical attainments are widely recognized and much of his success has been due to his rapid grasp of all mathematical questions and to the closely allied faculty of logical and accurate analysis in problems of other kinds. In 1876 he was admitted to the standing of a Dominion Land Surveyor and a Topographical Surveyor being the first to receive the latter commission. In 1904 he was given the honorary degree of LL.D. by his alma mater. He was elected to Fellowship in the Royal Society in 1908 and to the Presidency, the highest scientific honour in Canada, in 1911. In 1909 he was made a Fellow of the Royal Astronomical Society of Canada of which he had been Honorary President since 1906; and was a member of several other learned and scientific Societies.

He entered the services of the Dominion Government on Sept. 1, 1872, as previously stated and, except for the few months in 1875 when he obtained his degree, his services have since been continuously

devoted to his country and they form one long record of achievements, appointments and honours. His first permanent appointment as Inspector of Surveys Interior Department was of date June 13, 1881, and was followed by the appointment as Chief Inspector in 1886, Chief Astronomer in 1890, Director of the Dominion Observatory in 1905, and Superintendent of the Geodetic Survey of Canada in 1909.

In addition to his great mathematical and scientific ability, of which the above permanent departmental appointments furnish a striking evidence, Dr. King has performed very valuable services for Canada in the various boundary questions which have arisen with the United States. The keenness and judicial bent of his mind enabled him to quickly grasp and clearly present the essential features of any question and his numerous appointments as His Majesty's Commissioner for various sections of the International boundary in 1892, 1899, 1901, 1902, 1904, 1906, 1908, present evidence of the value placed on his services by the Government. He was also appointed to the International Waterways Commission serving from 1903 to 1907 and was made the representative of the Canadian Government in the negotiations relative to the uses of international waters for irrigation in 1908. It was probably largely owing to his valuable work on international boundaries and these allied questions that he was created Companion of the Order of St. Michael and St. George on June 26, 1908.

Dr. King's greatest work on behalf of pure science was probably the founding and organization of the Dominion Observatory. He began to urge the construction of an Observatory for Canada at first on a very modest scale over twenty-five years ago, and though not for some time successful he persevered in his quiet, yet effective way and gradually brought the Government to see the value of such an institution. Success crowned his efforts during the administration of Hon. Mr. Sifton in the Interior Department, who recognized fully the high attainments of Dr. King and his great services to the country in boundary questions and who saw clearly the advantages of a national Observatory.

This institution though only established about ten years and possessed of a comparatively modest equipment has attained an enviable position in the scientific world largely owing to Dr. King's faculty of selecting suitable men and making them responsible for the work. The equipment for astronomical research will shortly be greatly increased by the completion of the 72-inch reflecting telescope larger than any now in existence. This project was first formally brought to the attention of the Government by a Memorial from the Royal Society in 1912. It is undoubted that the confidence and high



FREDERICK WILLIAM KING

esteem, with which Dr. King was regarded by the Government, was a large factor in obtaining the consent to proceed with the work in 1913.

But this by no means ends the record of his scientific activities for it is practically wholly due to his persistent and able efforts and to his diplomatic and well timed action that Canada has now energetically undertaken a Geodetic Survey on the most modern lines and that we may soon hope to have a system of primary points accurately determined both in position and elevation over the principal settled portions of the country.

Notwithstanding the administrative and technical work entailed by these three large departments, Boundary Surveys, the Observatory, and Geodetic Surveys, Dr. King still found time to prepare many scientific papers for publication and in the earlier days computed valuable tables for use in various surveying operations. His paper on the "Geometry of Orbits" is a classic on the subject and presented an entirely original and ingenious method of obtaining the elements of the orbit of a spectroscopic binary and this method is used here and elsewhere in binary work.

Through all these manifold activities and honours, Dr. King maintained the same quiet, unassuming, even reticent manner. Outside of his own staff and those directly associated with him, very few people realized even faintly his great abilities and his magnificent scientific and public services, or had any adequate conception of the great and many sided scientific department he had built up. There is certainly no one in Canada who possesses his broad, varied and detailed knowledge of all branches of surveying and geodesy, of astronomy, and geophysics.

Dr. King was prominent in Church circles, having taken a very active part in the work of St. George's Church, Ottawa, filling in succession all the important lay offices of the Parish, and was at the time of his death representative to the Provincial and General Synods.

The Royal Society has lost an eminent and faithful member, the staff of the Astronomical Branch a most generous and considerate Chief, and Canada a devoted and valuable officer in the death of Dr. W. F. King.

IV.—ADVISORY ASSISTANCE TO THE GOVERNMENT IN RESEARCH WORK

One of the most important matters that will engage your attention is the subject that was brought to your notice in a circular letter addressed to the Honorary Secretary by the President on February

21st last. It is thought advisable to reproduce the President's letter and to ask for its subject matter your very earnest attention.

The public mind is at present much occupied with the question of trade and industrial conditions at the close of the war, and perhaps especially with the matter of preventing the renewal of importations from Germany. When it is remembered how considerable these imports were in many different departments of industrial activity, it seems reasonable to assume that the laboratories of the Canadian universities could be of material assistance to our manufacturers in solving the scientific problems which the manufacture of such articles presents. It has thus been suggested that the universities should be "mobilized" for industrial scientific purposes.

The Royal Society has on several occasions sought to be of service to the country and to the Government in practical matters of national concern, *e.g.*, the question of continental time with which the name of the late Sir Sandford Fleming is connected, the matter of Fishery Stations, the relation of ice formation to the navigation of the St. Lawrence to which Professor Barnes has given so much attention. The representative character of the Royal Society would suggest that it is the proper body to offer its assistance to the Government in the matter to which I have referred. It represents the different provinces, the universities, and the scientific branches of the public service.

It has been suggested therefore that the Society appoint a strong committee to wait on the Dominion Government for the purpose of urging the great need of encouraging industrial scientific research; and that the Society offer its services to the Government in the furtherance of research. The encouragement could take the form of grants to competent persons in our universities to carry on investigations of value to Canadian industries, on the principle followed by the Carnegie Institution of Washington. The National Physical Laboratory of Teddington, England, which was "founded . . . for research into matters of technical and industrial importance, is controlled by a Board representing the Royal Society and the great technical institutions."

The Royal Society could appoint a permanent Committee to advise the Government in the direction and control of research work and in the allotment of grants for the furtherance of such work.

The Council recommends that this most important subject be considered by the Sections of the Society with a view to the formulation by each of a list of scientific problems in which assistance can be rendered the Government by the Society, and that each Section shall appoint not more than three of its members to represent it in a special committee of the Society which shall consider this question with a view to bringing the matter to the attention of the Government.

V.—PERMANENT QUARTERS FOR THE SOCIETY

This topic is yet a live one and it is noticed with pleasure that one of our Fellows, the Hon. Rodolphe Lemieux, mentioned the matter in the House of Commons on April 13th. The Hon. the Minister of Public Works stated that the value of The Royal Society was appreciated, "and when conditions become normal consideration will be given at the earliest possible moment to the matter of finding a more suitable home for the Society than that which they have at the present time."

VI.—THE WAR

The war in Europe continues to affect the usual routine business of the Society, as has already been remarked. We have, however, continued our distribution of the publications to all except the enemy countries. Not a few of our members are serving at the front, and we would suggest that this year a cordial message should be sent to these Fellows, which will remind them that their absence from our meetings is regretted, and that their safety and success are of close interest to us.

VII.—THE 72-INCH REFLECTING TELESCOPE

Progress on the 72-inch reflecting telescope has been very satisfactory during the past year and it is now approaching the final stages of erection and adjusting.

The mounting has been completed and temporarily erected at the factory of the Warner & Swasey Co. and all the operating mechanism tested. The whole massive machine, the moving parts of which weigh upwards of 40 tons, works with the greatest smoothness and ease, and can be set, driven and guided by means of the seven electric motors and the conveniently situated stationary and portable switch boards with the utmost facility; indeed this enormous mechanism can be operated and handled with greater ease than many small telescopes. The mounting will be taken down and shipped to its observatory as soon as the erection of the dome is sufficiently advanced.

The 73-inch mirror, the principal optical part of the telescope is in the spherical form and is waiting now the completion of the large testing plane required for the parabolizing of the surface and its final completion. The smaller optical parts are all completed and attached to the mounting. It is hoped that the mirror will be ready as soon as the mounting is erected and ready to receive it, which will be towards the end of the summer.

The massive pier which supports the telescope was completed last fall and the surrounding circular steel building 66 feet in diameter during the winter. The dome also constructed by the Warner & Swasey Co., which rests and revolves on this building, arrived in Victoria about the end of March, and is now being erected. This dome will be the most complete and convenient as well as the most carefully designed to work in proper conjunction with the telescope of any in the world.

One of the observer's residences has been erected but none of the other buildings required have yet been begun. It is hoped, however, that everything will be ready to begin regular observing with this magnificent equipment next spring after the considerable preliminary experimental and adjusting work has been completed.

VIII.—THE DIPLOMA

The form used in granting the Diplomas of the Society has been out of print for some time, and the Council has pleasure in stating that a new form has been engraved and the Diplomas for the members lately elected will be forwarded without delay. A copy of the Diploma has been laid upon the table.

IX.—THE CHARTER BOOK

The officers of the Society have recommended the establishment of a Charter Book in which the Fellows can subscribe to the obligations which devolve upon them as members of the Society. It is a matter for regret that this book was not established when the Society was founded, but it is the intention to supply the signatures of deceased members. The facsimile of the Charter Book of The Royal Society of London has been laid upon the table for the information of the Fellows in this connection.

X.—A NATIONAL LIBRARY

The Society has memorialized the Government on the subject of a National Library, and has urged the importance of expanding the present Library of Parliament into a National Institution. Attention is again called to this subject by the disastrous fire which consumed the Legislative building at Ottawa.

It is most fortunate that the Library was saved, but it cannot be doubted that it is still exposed to very great danger, and we think it a duty of the Society to represent this fact to the Government and to request that steps be taken to render the Library building thoroughly fireproof, and that, when the buildings are being re-designed, the needs of the Library should be carefully considered and that the arrangements for the protection and use of the valuable collections should be thoroughly modernized.

XI.—COMMEMORATION OF CONFEDERATION

In the opinion of the Council the 50th Anniversary of Confederation should be recognized at the meeting of The Royal Society in 1917.

In the various Sections there should be reviews of the progress of literature and science in Canada during this period.

Each Section should at this year's meeting assign to certain members the preparation of a paper or papers dealing with this

progress; and it is suggested that the Presidents of Sections might advantageously choose some aspect of this subject for the addresses to their respective Sections.

XII.—FINANCES OF THE SOCIETY

The following is the financial statement of the Honorary Treasurer for the year ending April 30th, 1916. The statement includes the Government Grant Account and the General Account and it has been audited by two members of the Society: Dr. Adam Shortt and Dr. J. C. Glashan, who were appointed by the Council for that purpose:

STATEMENT OF RECEIPTS AND EXPENDITURE OF THE ROYAL SOCIETY OF CANADA FOR THE YEAR ENDING 30th APRIL, 1916

GOVERNMENT GRANT ACCOUNT

RECEIPTS

By Balance in Bank of Montreal.....	\$ 5,115.42
" Grant from Dominion Government.....	8,000.00
" Bank Interest on account.....	220.64

\$13,336.06

EXPENDITURES

To Printing and Publication of Society's <i>Transactions</i> (Parts vols. VIII and IX) and Notices.....	\$ 9,436.06
" Maintenance of Society's Library: Clerical Assistance, Supplies and Postage.....	658.50
" Clerical Assistance.....	365.00
" Foreign Postage on <i>Transactions</i>	167.07
" Storage and Insurance of Society's property.....	48.00
" Expenses of Annual Meeting, Ottawa, 1915.....	96.52
" Incidental Expenditure.....	10.38
" Balance in Bank of Montreal, April 30th, 1916.....	2,509.53
" Cheques outstanding from 1914-15.....	60.00

\$13,351.06

Less outstanding cheque..... 15.00

\$13,336.00

GENERAL ACCOUNT

RECEIPTS

By Balance in Merchants' Bank of Canada.....	\$3,521.57
" Annual Subscriptions.....	510.50
" Life Membership.....	50.00
" Sale of <i>Transactions</i>	63.70
" Interest on Investments: Standard Trusts Co.....	460.25
Lampman Mortgage.....	61.75
" Bank Interest on account.....	30.90

\$4,698.67

EXPENDITURE

To Railway fares of Members attending Annual Meeting, Ottawa, 1915..	\$ 961.90
" Purchase of Mortgage on Lampman Estate.....	1,900.00
" Purchase of volumes of Society's <i>Transactions</i>	31.00
" Incidental Expenditure.....	10.00
" Balance in Merchants Bank of Canada, April 30th, 1916.....	1,795.77
	<hr/>
	\$4,698.67

Audited and found correct.

ADAM SHORTT, }
J. C. GLASHAN, } *Auditors.*

Ottawa, May 4, 1916.

C. GORDON HEWITT,
Honorary Treasurer.

XIII.—REPORT OF HONORARY LIBRARIAN

The larger part of the accessions to the Library are by exchange with other societies. There are of these about 242 contributing annual volumes or monthly numbers. Since the war started the contributions from the enemy countries have ceased, thus affecting about 27 of the number given above.

The Librarian reports that the making of a card catalogue is in progress and about 2,900 entries have been made. Donations have been received from the following:

The estate of the late Dr. G. M. Dawson, through the executors,
13 volumes of Reports of American Bureau of Ethnology.

The estate of Sir Wm. Dawson, through Mr. W. B. Dawson,
1 volume entitled "Landfall of L. Erickson."

Miss Woodbury Blair, through Dr. H. M. Ami, 2 volumes Spanish
Settlements in United States.

The Norwegian Aurora Polaris Expedition, 1 volume. Report
for 1902-1903.

Interior Department, Ottawa. 1 volume, "The Unexploited
West."

Maine Historical Society, 15 volumes various papers.

Missouri Historical Society, 7 volumes various papers.

University of California. Many publications to fill gaps in
series on our shelves.

Library of Geological Survey, Canada. Reports of Ontario
Bureau of Archives for 1904-05-06.

12 volumes History of the Colony of Plymouth.

12 volumes Calendar of State Papers, England.

Reports of Canadian Archives, 1881-1906.

19 Annual Reports of Geological Survey.

- 2 Summary Reports of Geological Survey.
- 33 Publications.
- 2 Memoirs.
- 3 Museum Bulletins.
- A number of separate papers.
- International Joint Commission, through Mr. L. J. Burpee.
- 6 volumes of reports.
- 3 pamphlets.
- Mr. Wm. McInnes. 1 volume Coal Resources of Brazil.

D. B. DOWLING,

Honorary Librarian.

When the Honorary Secretary had finished reading the Report, it was moved by Mr. Lambe, seconded by Dr. Coyne, that the Report of Council be received and that the question of adoption be voted on to-morrow.—Carried.

It was moved by Dr. Ernest Myrand, seconded by His Grace Mgr Paul Bruchesi, that the election of M. C.-Marius Barbeau, L'abbé Emile Chartier and Dr. Victor Morin, as Fellows of Section I, be confirmed.—Carried.

It was moved by Mr. Lighthall, seconded by Dr. Coyne, that the election of Dr. Robert A. Falconer, Dr. Archibald MacMechan, and Dr. Oscar D. Skelton, as Fellows of Section II, be confirmed.—Carried.

It was moved by Dr. Shutt, seconded by Dr. Plaskett, that the election of Prof. H. L. Bronson, as a Fellow of Section III, be confirmed.—Carried.

It was moved by Dr. Macallum, seconded by Dr. Prince, that the election of Dr. C. McLean Fraser, Dr. D. Fraser Harris, Dr. Andrew Hunter and Prof. F. E. Lloyd, as Fellows of Section IV, be confirmed.—Carried.

Those of the new members who were present, M. Barbeau, Abbé Chartier, Dr. Morin, Dr. Bronson, Dr. Hunter and Dr. Harris, were then introduced to the President, as well as Dr. A. S. MacKenzie, elected in 1913, Dr. T. G. Brodie, elected in 1911, and Dr. W. A. Parks, elected in 1915.

It was moved by Dr. Coyne, seconded by Hon. Mr. Justice Longley, that Prof. W. H. Siebert, of the Ohio State University, Columbus, Ohio, be elected a Corresponding Member of the Society in accordance with the recommendation made by the Fellows of Section II at the Annual Meeting in 1915. Action on this resolution was deferred until a subsequent session.

The meeting then took up the consideration of the proposed amendment to the By-laws by Dr. A. B. Macallum, printed copies of which had been placed in the hands of the Fellows. The president called upon Dr. Macallum, who gave a verbal explanation of the meaning and effect of the suggested change; this explanation was followed by discussion, in which several of the Fellows took part, and further consideration was postponed until a subsequent session.

THE PRESIDENTIAL ADDRESS

The Presidential Address was delivered on Tuesday evening in the concert hall of the Chateau Laurier. The chair was occupied by the Vice-President. The President's subject was, "Canada's Intellectual Status and Intellectual Needs." The address will be found printed in full as Appendix A.

SESSION II.—(Wednesday, May 17)

The President took the chair at 12 o'clock.

It was moved by Mr. Burpee, seconded by Mr. White, that the Report of Council be adopted.—Carried.

The following new members who had arrived in the interval were then introduced to the President:—Dr. Oscar D. Skelton and Prof. Francis E. Lloyd, as well as Dr. Maurice Hutton, who had been elected in 1913.

The motion for the election of Professor Siebert as a Corresponding Member in Section II was now presented to the Society and carried.

The meeting then took up further consideration of Dr. Macallum's proposed amendment of the By-laws and after some discussion it was moved by Dr. Macallum, and seconded by Dr. MacKay, that, the present Section VI of the By-laws of the Society shall apply only to Sections I, II and III, and that the amendment proposed by Dr. Macallum shall apply to Section IV and to such other Sections as may hereafter decide to adopt it.—Carried.

The amendment is as follows:—

1. Change "fifteenth day of February" in second last line of paragraph 3, section VI, to "fifteenth day of January."
2. Change "fifteenth of February" of paragraph 4, section VI, to "fifteenth of January."
3. Change "first day of March" of paragraph 5, section VI, to "first day of February."
4. Substitute in place of paragraph 6, section VI, the following—:

At a meeting to be held in Ottawa on the third Friday of February; the Council with three members elected for that purpose from

and by the Section at the Annual Meeting of the previous year, shall select from the list of candidates nominated to the Section, a number equivalent to that which the Section is entitled to elect to membership for that year, to be recommended for election.

The Honorary Secretary shall, on or before the first day of March, forward to the members of the Section a printed ballot containing the names of the candidates so recommended for election, and with space on the ballot opposite each name for the name of any other candidate nominated, for whom a member may desire to vote, instead of for the one recommended.

Each ballot, signed with the name of the member and with such erasures of names and the substitution of others, as each member may individually make, may be returned on or before the first of April to the Honorary Secretary, who shall report to Council at a meeting to be held before the Annual Meeting the number of votes obtained by each candidate. Should any of these have obtained a majority of the votes cast by the Section, the Council shall so report to the Society at the next Annual Meeting, and the election shall then be confirmed by the Society.

It was moved by His Grace Archbishop Bruchesi and seconded by Sir William Peterson, that the Society endorse the views expressed by the President in his address,—that in the schools of the Dominion increased attention be paid to the study of French language and French literature.—Carried.

Dr. R. F. Ruttan then communicated to the meeting a further report of the committee appointed to study the question of Carbon Monoxide in Illuminating Gas, as follows:—

To the President and Fellows of the Royal Society of Canada:

Your committee appointed to study the question of carbon monoxide in illuminating gas, has had several meetings during the year; one of the members, Dr. J. J. MacKenzie, who is now serving in Salonika with the No. 4 University Base Hospital, was absent during the year. Owing to the disturbed conditions caused by the war, no information regarding the laws controlling carbon monoxide in illuminating gas has been obtainable from any of the countries on the continent of Europe where such legal control exists.

The Registrar General of Great Britain in reply to an enquiry furnished us with a tabulated statement of deaths from accident and suicide due to coal-gas and carbon monoxide. The total deaths recorded in 1913 from gas poison were 241, of which 77 were accidental 161 suicidal, and 3 homicidal.

In reply to a letter from the Chairman, Dr. Girdwood, the State of Massachusetts sent a copy of recent legislation giving municipalities power to control the quality and price of illuminating and heating gas. The Board of Gas and Electric Light Commissioners of Boston as a result have regulated not only the quality of the gas but the profits to be made by the Consolidated Gas Companies of that city.

The provincial Registrars of all the provinces of Canada were written to and requested to send statistics regarding deaths from illuminating gas. Alberta, British Columbia, New Brunswick, Nova Scotia and Ontario could give no statistics, deaths from gas being recorded as accidental or suicidal.

Dr. E. Pelletier of Quebec Provincial Board of Health, however, reports 42 deaths from gas poisoning in 1913, of which 20 occurred in Montreal. Statistics for 1914 and 1915 were not completed, but at least 14 deaths from gas poisoning occurred in Montreal in 1914.

We would again call attention to the unsatisfactory manner in which records of causes of deaths are kept in the various provinces.

From a report obtained by the Hon. Secretary of the Royal Society and forwarded to us from the Deputy Minister of Inland Revenue, it is evident that the inspection and control of gas supplies from a hygienic point of view lies with the municipalities and the Provincial governments. The Dominion government controls only the calorific power of the gas.

It is further evident that gas for illuminating purposes is largely being replaced even in the smaller towns by electricity.

Owing to the impossibility of obtaining proper statistics of deaths and injury from the use of the gas carrying a high percentage of carbon monoxide, and the increased development of its employment as a source of heat and power where the products of combustion and leakage are removed by pipes and chimneys, we consider that it is unwise at present to ask for legislative interference with its use.

Your committee is nevertheless fully convinced of the danger to the community arising from the use of water gas and similar gases carrying a large quantity of the poisonous carbon monoxide, and even if the amount of this poison in the gas cannot be controlled by law, every municipality should be informed by frequent analyses of the degree of danger from this source to which its inhabitants are exposed in using the Public Gas supply.

Signed,

G. P. GIRDWOOD, *Chairman*,

T. G. RODDICK,

R. F. RUTTAN.

On motion of Dr. Ruttan and Dr. Ellis this report was adopted.

In reference to the recommendation of Council regarding advisory assistance to the Government in connection with research work it was moved by Dr. Shortt, seconded by Dr. Adams, that The Royal Society of Canada should in all possible directions promote the work of scientific research and in particular at the present time industrial scientific research, and that as one means of furthering this general aim The Royal Society should appoint a strong committee to wait upon the Dominion Government for the purpose of urging the great need of encouraging industrial scientific research and of offering the services of the Society to the Government in the furtherance of this research.—Carried.

To carry out the above resolution the following committee was appointed by the President to act with him:—

Section I.—Mr. L. Gérin, Hon. R. Lemieux and Dr. P. B. Mignault.

Section II.—Dr. A. Shortt, Dr. O. D. Skelton, Dr. George Bryce, Hon. W. L. MacKenzie King and Mr. L. J. Burpee.

Section III.—Dr. H. T. Barnes, Dr. W. H. Ellis, Dr. L. V. King, Dr. A. Stanley MacKenzie, Dr. C. H. McLeod, Dr. F. T. Shutt and Dr. Alfred Stansfield.

Section IV.—Mr. J. B. Tyrrell, Dr. A. B. Macallum, Dr. A. P. Coleman, Dr. J. H. Faull, Dr. C. Gordon Hewitt, Mr. R. G. McConnell, Dr. W. A. Parks and Dr. A. H. R. Buller.

SESSION III.—(Wednesday afternoon, May 17)

The reports of the following Associated Societies were read or presented:—

1.—The Entomological Society of Ontario by Francis J. A. Morris, Delegate.

2.—The Women's Canadian Historical Society, by Mrs. W. C. Gullock, Delegate.

3.—The Elgin Historical and Scientific Institute, by Dr. J. H. Coyne, F.R.S.C., President and Delegate.

4.—The Huron Institute.

5.—The Niagara Historical Society.

6.—The Ottawa Field Naturalists' Club, by Harlam I. Smith, President and Delegate.

7.—The Women's Canadian Historical Society of Toronto.

8.—The United Empire Loyalists' Association of Canada.

9.—Club Littéraire Canadien Français d'Ottawa.

10.—The Historic Landmarks Association of Ottawa, by Mrs. J. B. Simpson, General Secretary and Delegate.

11.—The Antiquarian and Numismatic Society of Montreal, by Pemberton Smith, Delegate.

12.—The Natural History Society of Montreal, by Alfred Griffin, Secretary and Delegate.

13.—Société Historique de Montréal, by Aegidius Fauteux.

14.—The Quebec Literary and Historical Society, by Dr. J. M. Harper, Delegate.

15.—The Nova Scotia Institute of Science, by Dr. D. Fraser Harris, F.R.S.C., President and Delegate.

16.—The Natural History Society of New Brunswick, presented by William McIntosh, Curator and Delegate.

17.—In addition to the above Professor W. Lochhead gave a verbal outline of the work of the Quebec Society for the Protection of Plants from Insects and Fungus Diseases.

THE POPULAR LECTURE

The popular lecture was delivered on Wednesday evening in the concert hall of the Chateau Laurier. In commemoration of Shakespeare's tercentenary a Shakespearian subject had been chosen, and the Society was fortunate in securing Dr. John W. Cunliffe, of Columbia University, New York, to deliver the lecture. His subject was, "Shakespeare's Songs." Interest was added to the brilliant lecture by the singing of three groups of songs by M. Antoine de Vally, a Belgian tenor of high reputation. M. de Vally sang the following songs:—

FOUR SONGS FROM THE COMEDIES

1. Under the greenwood tree (As You Like It), *Arne* (1710-1778).
2. Blow, blow, thou winter wind (As You Like It), (*Arne*).
3. It was a lover and his lass (As You Like It), *Morley* (1557-1604).
4. O Mistress mine (Twelfth Night), *Byrd* (1538-1623),.

FOUR SONGS OF THE TRAGIC PERIOD

1. Take, O take those lips away (Measure for Measure), *Wilson* (1594-1673).
2. To-morrow is Saint Valentine's day (Hamlet), *Old Air* (possibly contemporary).
3. In youth, when I did love (Hamlet), *Old Air* (sixteenth century).
4. O Willow (Othello), *Old Air* (from a MS. in the British Museum).

THREE SONGS FROM "THE TEMPEST"

1. Come unto these yellow sands, *Banister (1630-1679)*.
2. Full fathom five, *Johnson (1612)*.
3. Where the bee sucks, *Johnson (1612)*.

SESSION IV.—(Thursday afternoon, May 18)

REPORTS OF THE SECTIONS

SECTION I

Séance du mardi, 16 mai, à 3.30 p.m.

Présents: MM. Ernest Choquette, A.-D. DeCelles, vice-président; C.-Marius Barbeau, S. G. Mgr Bruchési, l'abbé Emile Chartier, Léon Gérin, l'abbé A.-H. Gosselin, Victor Morin, Ernest Myrand, le sénateur Pascal Poirier, Eugène Rouillard, Benjamin Sulte, Louvigny de Montigny, secrétaire.

Se sont excusés: Mgr A. Gosselin, président; MM. Edouard Montpetit, Mgr Louis-A. Paquet, Adjutor Rivard et l'abbé Camille Roy.

Sur proposition de M. l'abbé Gosselin, appuyé par M. Rouillard, il est

Resolu: Que M. A.-D. DeCelles soit nommé membre du Comité de mise en nomination des dignitaires généraux de la Société Royale, avec l'honorable M. Rodolphe Lemieux qui a été choisi, l'an dernier, pour faire partie de ce Comité.

Sur proposition de Mgr Bruchési, appuyé par M. Victor Morin, il est

Résolu: Que la Section I de la Société Royale adresse ses respectueux remerciements à l'honorable Secrétaire de la province de Québec pour le service qu'il a fait faire aux membres de cette Section de *l'Annuaire statistique* de la province de Québec; et qu'elle félicite l'honorable Secrétaire de la province de Québec de cette heureuse création, ainsi que son département qui a su donner à cet annuaire toute la couleur locale désirable et y inclure des renseignements aussi copieux que précis devant intéresser l'étranger sur l'histoire et les divers mouvements de la province de Québec, et devant documenter les hommes d'études canadiens sur les questions québécoises. La Section I de la Société Royale profite de l'occasion pour prier l'honorable Secrétaire de la Province de faire régulièrement adresser aux

membres de la Section I de la Société Royale les publications documentaires du gouvernement de Québec.

Le comité spécial institué l'an dernier pour solliciter du gouvernement de Québec une subvention devant permettre la fondation de prix à être décernés au nom du gouvernement de Québec par l'intermédiaire de la Section I de la Société Royale—rapporte progrès.

Sur proposition de M. DeCelles, appuyé par M. Sulte, il est

Résolu: De continuer dans ses fonctions le comité spécial institué l'an dernier pour l'objet susdit, et de prier ce comité de poursuivre ses démarches auprès du gouvernement de Québec.

Le secrétaire lit un communiqué du Conseil général soumettant aux diverses Sections un projet d'amendement aux règlements à l'effet de modifier la pratique jusqu'à présent suivie pour la présentation des candidats à la Société Royale.

Sur proposition de M. Victor Morin, appuyé par l'honorable M. Choquette, il est

Résolu: Que la Section I ne croit pas devoir approuver le projet d'amendement relatif au mode de présentation des candidats, et qu'elle recommande au contraire de maintenir le mode actuellement réglementaire qui semble donner toute la satisfaction désirable.

Sur proposition de M. Sulte, appuyé par M. l'abbé Chartier, il est

Résolu: Que, en vertu de l'article 8 des règlements, la Section I réclame le droit d'élire, aux élections de l'an prochain, trois nouveaux membres.

Les manuscrits suivants sont lus et renvoyés au Comité de lecture: *Vocables franco-algonquins*, par M. le sénateur Poirier; *Deux études*, par M. l'abbé A.-H. Gosselin; *Le crépuscule parle aux aubes*, poème de M. Jules Tremblay, présenté par M. DeCelles.

Séance du mercredi, 17 mai, à 9.30 a.m.

Présents, les mêmes et M. le sénateur L.-O. David, l'honorable Rodolphe Lemieux et Mtre P.-B. Mignault.

Sur proposition de M. Benjamin Sulte, appuyé par M. Ernest Myrand, il est

Résolu: Que le bureau de la Section I soit constitué comme suit pour le prochain exercice: Président, M.-A.-D. DeCelles; vice-président, M. le sénateur L.-O. David; secrétaire, M. Louvigny de Montigny; secrétaire adjoint, M. C.-Marius Barbeau.

Sur proposition de l'honorable M. Choquette, appuyé par M. Victor Morin, il est

Résolu: Que le Comité de lecture de la Section I soit constitué comme suit pour le prochain exercice: MM. DeCelles, Rivard et Montpetit.

Sur proposition de M. L. de Montigny, appuyé par M. l'abbé Chartier, il est

Résolu: Que MM. Benjamin Sulte et C.-Marius Barbeau représentent la Section I dans le bureau de publication des mémoires de la Société Royale.

Sont lus et renvoyés au Comité de lecture les manuscrits suivants: *Au pays de Lamartine*, par l'hon. M. Choquette; *Un essai d'arbitrage international*, par Mtre P.-B. Mignault; *Chansons patriotiques et chansons populaires*, par M. Ernest Myrand; *Un chapitre d'histoire contemporaine*, par Mgr Louis-A. Paquet.

Séance du jeudi, 18 mai, à 9.30 a.m.

Présents: les mêmes.

Sont lus et renvoyés au Comité de lecture les manuscrits suivants: *Les métamorphoses dans les contes populaires canadiens*, par M. C.-Marius Barbeau; *Une mission canadienne au Japon*, par l'hon. Rodolphe Lemieux; *Les transformations de la Société canadienne après la Conquête*, par M. Léon Gérin.

Faute de temps, les manuscrits suivants sont présentés et renvoyés au Comité de lecture: *La langue française au Canada—Son état actuel*, par M. Louvigny de Montigny; *Introduction à l'étude de l'Economie politique*, par M. Edouard Montpetit; *La Prévôté de Québec*, par M. Pierre-Georges Roy; *Origine de la Saint-Jean-Baptiste (1636-1836)*, par M. Benjamin Sulte; *Les tribunaux et les officiers de Justice à Montréal sous le régime français (1648-1760)*, par M. E.-Z. Massicotte, présenté par M. Benjamin Sulte; *Montalembert et le Canada*, par M. Antonio Perrault, présenté par M. Edouard Montpetit.

Ajournement.

L. DE MONTIGNY,

Secrétaire.

On the motion of Dr. Sulte, seconded by Abbé Chartier, the report of Section I was adopted.

REPORT OF SECTION II

Section II has every reason to congratulate itself this year on a very successful meeting. A number of interesting papers were read, including several of exceptional value. In view of the preoccupations of these strenuous times, and the fact that a number of our members are serving at the front or on this side of the ocean, the attendance has been very satisfactory.

Five sessions were held, two each on June 16th and 17th, and one on June 18th, with the president, Dr. Shortt in the chair. There

were present: Dr. Adam Shortt, Hon. J. W. Longley, Dr. W. W. Campbell, Dr. George Bryce, Mr. W. D. Lighthall, Mr. R. W. McLachlan, Mr. D. C. Scott, Sir Wm. Peterson, Dr. Maurice Hutton, Dr. J. H. Coyne, Mr. E. W. Thomson, Hon. W. L. Mackenzie King, Dr. W. D. LeSueur, Dr. O. D. Skelton and Mr. L. J. Burpee.

Dr. Bryce was elected to represent the Section on the Nominating Committee.

The Report of Council was taken up for consideration of such matters as required action by the Section.

It was decided that Section II does not concur in the Amendment of the By-laws proposed by Dr. A. B. Macallum, the consensus of opinion being that, so far as Section II is concerned, the system at present in force in the Section should be continued.

Dr. Shortt gave his Presidential Address on "The Economic Effects of the War on Canada," at 2.30 p.m. on Tuesday.

The Section considered the proposal of the Council as to Advisory Assistance to the Government in Research Work, and appointed a sub-committee, consisting of Hon. W. L. Mackenzie King, Dr. Shortt, Dr. Skelton and Dr. Bryce, to draft a report embodying the views of the Section. The report was submitted and adopted by the Section for submission to the Society.

Mr. Scott and Mr. Burpee were appointed a Committee to prepare a list of Fellows of the Society who are serving in connection with the war in any capacity.

It was also the opinion of the Section that the Society should recognize in some suitable way the fact that sons of some of our Fellows are at present offering their lives in the service of their country.

The Section considered the suggestion of Council that the fiftieth anniversary of Confederation should be recognized at the meeting of the Society in 1917, and concurred in the recommendations of Council.

The following resolution in the matter of a Canadian National Library was adopted for submission to the Society:

Moved by Mr. Burpee, seconded by Dr. Campbell—

That plans are now under consideration for the reconstruction of the interior of the Parliament Building; that these plans will doubtless include the Library of Parliament; that the Librarians of Parliament have for many years past reported the increasingly overcrowded state of the shelves, and the impossibility of providing further accommodation in the existing building; that the Royal Society of Canada has already urged upon the Dominion Government the desirability of establishing at the earliest possible date a Canadian National Library; that the present appears to be an appropriate time for

suggesting, as a permanent solution of the problem of overcrowding in the Library of Parliament, that the purely legislative character of that library be recognized, and that the books not needed for the purpose of Parliament—approximately two-thirds of the entire collection—be set apart as the nucleus of the proposed National Library.

The Section decided not to fill at present the existing vacancy in the Section.

On motion it was decided to report to the Society that the Section proposes to elect four members for the next year.

The following officers were duly elected:

President—Prof. Geo. M. Wrong.

Vice-President—Principal Hutton.

Secretary—L. J. Burpee.

Printing Committee—Dr. LeSueur, Mr. Burpee and Dr. Shortt.

The following papers were read during the sessions of the Section:—

1. An Historic War Crop—The Wheat Crop of 1915. By C. C. James, C.M.G., LL.D., F.R.S.C.

2. The Notable Story of Alexander Ross. By Rev. George Bryce, M.A., LL.D., F.R.S.C.

3. The Romance of the Cluni Manuscript of Cicero's Speeches against Verres. By Sir William Peterson, K.C.M.G., LL.D., F.R.S.C.

4. Signposts of Prehistoric Time. By W. D. Lighthall, M.A., B.C.L., F.R.S.C.

5. The Contest for the Command of Lake Ontario in 1912-13. By Col. E. A. Cruikshank, F.R.S.C.

6. Joseph Howe and the Anti-Confederation League. By L. J. Burpee, F.R.G.S., F.R.S.C.

7. The Canadian Snowshoe. By Thomas Drummond. Presented by Duncan C. Scott, F.R.S.C.

8. The Poetry of To-day. By Arthur L. Phelps. Presented by Dr. Pelham Edgar, F.R.S.C.

9. Place Names in the Southern Rockies. By James White, F.R.S.C.

10. Jolliet and Dollier on Lake Erie (1669-1670); Some Identifications. By James H. Coyne, M.A., LL.D., F.R.S.C.

11. Pierre du Calvet. By Hon. William Renwick Riddell, LL.D., F.R.H.S. Presented by Dr. James H. Coyne, F.R.S.C.

12. The King *versus* David McLane. By Hon. William Renwick Riddell, LL.D., F.R.H.S. Presented by C. C. James, C.M.G., LL.D., F.R.S.C.

13. The Mind of Thucydides and the Function of History. By Maurice Hutton, M.A., LL.D., F.R.S.C.

14. An organization of the Scientific Investigation of the Indian Place-nomenclature of the Maritime Provinces of Canada (Sixth Paper). By W. F. Ganong, M.A., Ph.D. Presented by Duncan C. Scott, F.R.S.C.

15. The Refugee Loyalists of Connecticut. By Professor W. H. Siebert, of the Ohio State University. Presented by W. D. LeSueur, LL.D., F.R.S.C.

L. J. BURPEE,

Secretary.

On motion of Dr. Hutton, seconded by Mr. Burpee, the report of Section II was adopted.

REPORT OF SECTION III

The Sessions of Section III have been well attended this year, and the papers have been of great interest and value.

There were present at the five sessions of the Section nineteen Fellows, namely:—Messrs. Baker, Barnes, Bronson, Dawson, Ellis, Glashan, Goodwin, Harkness, King, Klotz, Mackenzie, McClung, McGill, McLennan, McLeod, Plaskett, Ruttan, Shutt, Stansfield.

The Presidential Address, "Agricultural Research in Canada," and twenty-four other papers were presented to the Section at these sessions, a list of which is appended.

The election of officers for the Section resulted in the choice of the following:—

President—R. F. Ruttan, M.D., C.M., D.Sc.

Vice-President—A. S. Eve, D.Sc.

Secretary—F. T. Shutt, M.A., D.Sc.

The officers of the Section with Prof. Barnes and Prof. Harkness were appointed as the Sectional Printing Committee.

Dr. Klotz and Dr. Mackenzie were appointed as representatives of the Section on the Nominating Committee.

One new Fellow, H. L. Bronson, of Dalhousie University, was elected this year.

It was decided that only vacancies occurring in the Section be filled at the next election.

Consideration of the change in the By-laws referring to the method of nominating candidates for election to Fellowship was deferred until next year.

On business arising from the Report of Council, the suitable commemoration of the 50th Anniversary of Confederation was decided to be marked, at the meeting of 1917, by historical papers dealing with the progress of the various divisions of Mathematical and Physical Sciences. The officers of the Section were asked to select the members who would prepare such papers.

The important question of Industrial Research introduced by the President's letter was very thoroughly discussed at two sessions of the Section and various opinions as to the best method of procedure were advanced. The following resolution which was adopted represents the final conclusion of the members of Section III:—

"Whereas, it is important that the scientific forces of Canada should be organized to aid in the vigorous and efficient prosecution of the war and in the development of Canadian industries to meet the present conditions as well as those which may prevail after the war."

"Resolved that the Royal Society of Canada respectfully suggests to the Government the appointment of a Committee or Commission of scientific men whose duty it shall be to advise the Government how best to utilize the men and laboratories available for such purposes."

The work of the Committee appointed last year for the purpose of considering the possibility of organizing a computing bureau was continued by the reappointment of this Committee.

LIST OF PAPERS PRESENTED IN SECTION III

Presidential Address. By Dr. F. T. Shutt, M.A., F.I.C.—Agricultural Research in Canada.

1.—The Turn of Tidal Streams in Relation to the Time of the Tide. By W. Bell Dawson, M.A., D.Sc., M.Inst., C.E., F.R.S.C.

2.—The Smelting of Titaniferous Iron Ores. By Alfred Stansfield, F.R.S.C., D.Sc., A.R.S.M., Professor of Metallurgy, McGill University, and William Arthur Wissler, M.Sc., of McGill University.

3.—Factors Connecting the Concentration and the Optical Rotatory Power of Aqueous Solutions of Nicotine. By Alfred Tingle and Allan A. Ferguson. Presented by Prof. W. R. Lang, F.R.S.C.

4.—A New Method for the Determination of Nicotine in Tobacco. By Alfred Tingle and Allan A. Ferguson. Presented by Prof. W. R. Lang, F.R.S.C.

5.—The Influence of Fertilizers on the Flow of Water through Soils. By C. J. Lynde, Ph.D., Prof. of Physics and R. Dougall, B.S.A., Research Assistant under the Dominion Grant for Agriculture, Macdonald College, P.Q. Presented by Dr. H. T. Barnes, F.R.S.C.

6.—On the Initial Charged Condition of the Active Deposits of Radium, Thorium and Actinium. By G. H. Henderson, B.A., B.Sc., Instructor in Physics, Dalhousie University. Presented by H. L. Bronson, F.R.S.C.

7.—The Structure of Hailstones of Exceptional Form and Size. By Francis E. Lloyd. Presented by Prof. C. H. McLeod, F.R.S.C.

8.—Human Adipocere. By R. F. Ruttan, M.D., F.R.S.C.

9.—Formation of Ring Ice or Hoar Frost in Pipes. By Prof. H. T. Barnes, F.R.S.C.

10.—Contact Resistance in Oil. By H. E. Reilley, M.Sc., and Violet Henry, M.Sc. Presented by Prof. H. T. Barnes, F.R.S.C.

11.—The Contact Resistance between Conductors in Relative Motion. By Violet Henry, M.Sc. Presented by Prof. H. T. Barnes, F.R.S.C.

12.—The Solubility of Aluminium Hydroxide in Solutions of Ammonia. By E. H. Archibald and T. Habasian. Presented by Prof. Ruttan, F.R.S.C.

13.—The Occlusion of Iron by the Ammonium Phosphomolybdate Precipitate. By E. H. Archibald and H. B. Keegan. Presented by Prof. Ruttan, F.R.S.C.

14.—A Comparison of Radium Standard Solutions. By J. Moran. Presented by Prof. A. S. Eve, F.R.S.C.

15.—The Release of Radium Emanation from Water at Different Temperatures by Bubbling Air through the Solution at a Uniform Rate. By J. Moran. Presented by Prof. A. S. Eve, F.R.S.C.

16.—The Double Salts Formed by Sodium and Potassium Carbonates. By J. W. Bain, F.R.S.C., and C. E. Oliver.

17.—On the Effect of Stationary Sound Waves on Viscous Flow in Pipes and Channels. By Louis Vessot King, M.A. (Cantab.), D.Sc. (McGill), F.R.S.C., Associate Professor of Physics, McGill University, Montreal.

18.—Concerning a Certain Non-involutory System of Partial Differential Equations. By C. T. Sullivan. Presented by Jas. Harkness, F.R.S.C.

19.—The Algebraic Basis for Two Formulae in the Theory of Expansions According to Bessel Functions. By James Harkness, M.A., F.R.S.C.

20.—Alternate Number Indices in Triangular Co-ordinates. By J. C. Glashan, LL.D., F.R.S.C.

21.—On the Scattering and Attenuation of Radiation in the Solar Atmosphere. By Louis Vessot King, M.A. (Cantab.), D.Sc. (McGill), F.R.S.C., Associate Professor of Physics, McGill University, Montreal.

22.—On Boundary Conditions in the Dynamical Theory of Gases. By Louis Vessot King, M.A. (Cantab.), D.Sc. (McGill), F.R.S.C., Associate Professor of Physics, McGill University, Montreal.

23.—Progress on 72-inch Reflecting Telescope. By Dr. J. S. Plaskett, F.R.S.C.

24.—Hygrometry. By A. Norman Shaw, B.A. (Cantab.), D.Sc., Macdonald College, McGill University. Presented by Professor H. T. Barnes, F.R.S., F.R.S.C.

On motion of Dr. A. Stanley MacKenzie, seconded by Dr. Stansfield, the report of Section III was adopted.

REPORT OF SECTION IV

Section IV begs to report that five sessions were held, presided over by Mr. J. B. Tyrrell. Twenty-nine Fellows have been in attendance: Messrs. Adams, Bailey, Bethune, Brodie, Buller, Coleman, Dowling, Dresser, Faribault, Faull, Grant, Harrison, Hewitt, Huard, Lambe, Macallum, Mackay, McConnell, McInnes, McMurrich, Matthew, Moore, Parks, Prince, Tyrrell, White, Harris, Hunter, and Lloyd. Four absent Fellows are on active service: Dr. Adami, Dr. Harrison, Dr. J. J. MacKenzie, and Dr. Nicholls.

To the membership were added the names of Professors Harris, Hunter, Lloyd and Fraser.

Considerable time was devoted by the section to a discussion of the subject of industrial research; a committee consisting of Drs. Adams, Macallum, and Hewitt was appointed to confer with a similar committee from Section III. The report of this committee was adopted, to the effect that the Society should place its services at the disposal of the Government, though no decision was reached as to the exact manner in which these services might be rendered.

The Section expressed its approval of the notice of motion presented to the General Society by Professor Macallum dealing with a change in the mode of election of new members, and appointed the following three members under the provisions of the By-law: Dr. E. E. Prince, Dr. Frank D. Adams and Dr. F. C. Harrison.

It was decided to elect three new members to fill existing vacancies in the present roll of membership in the coming year.

The following officers were chosen for the year 1916-17:

President—J. P. McMurrich.

Vice-President—R. G. McConnell.

Secretary—J. J. Mackenzie.

Acting-Secretary—J. H. Faull.

Publication Committee—Dr. Hewitt, Mr. Dowling, and Dr. Harrison.

Twenty-one papers, a list of which is appended, including a presidential address of much interest on "Notes on the Geology of

the Nelson and Hayes River, Manitoba," were presented to the Section, contributions in the gross that represented a large amount of important and stimulating work.

All of which is respectfully submitted.

J. H. FAULL,

Acting Secretary.

LIST OF PAPERS PRESENTED IN SECTION IV

1.—Presidential Address.—"Notes on the Geology of the Nelson and Hayes River, Manitoba." By J. B. Tyrrell, F.R.S.C.

2.—Notes on the Plankton of the British Columbia Coast. By J. Playfair McMurrich, F.R.S.C.

3.—On a New Anthomedusan from the Coast of British Columbia. By H. B. Bigelow. Presented by Professor McMurrich, F.R.S.C.

4.—The Quantitative Study of Climatic Factors in Relation to Plant Life. By J. Adams, M.A. Presented by C. Gordon Hewitt, D.Sc., F.R.S.C.

5.—Geologic Range of the Phyla, Classes, Subclasses, and Orders of the Plant and Animal Kingdoms. By Lancaster D. Burling. Geological Survey, Canada. Presented by Lawrence M. Lambe, F.R.S.C.

6.—Ganoid Fishes from near Banff. By Lawrence M. Lambe, F.R.S.C., F.G.S.A., Vertebrate Palæontologist to the Geological Survey, Canada.

7.—Achondroplasia, a Problem in Development. By Albert G. Nicholls, M.A., M.D., D.Sc.

8.—Studies on a Timber Destroying Fungus—*Fomes Officinalis*. By J. H. Faull, Ph.D., F.R.S.C.

9.—Notes on Cambrian Faunas. By G. F. Matthew, LL.D., D.Sc.

10.—Studies on the Protozoan Parasites of the Fishes of the Georgian Bay. By J. W. Mavor, B.A., Ph.D., University of Wisconsin, Madison, U.S.A. Presented by E. E. Prince, LL.D., F.R.S.C.

11.—Statistical Studies on the Growth of the Pollock, Haddock, and Hake. By J. W. Mavor, Douglas Macallum, and Dorothy Duff; with Twenty Figures. Presented by E. E. Prince, LL.D., F.R.S.C.

12.—The Abscission of Flower-buds and Fruits in its Relation to Environmental Changes. By Prof. Francis E. Lloyd, F.R.S.C.

13.—On the Development of *Aequorea forskalea*. By C. McLean Fraser, Ph.D., F.R.S.C.

14.—Bibliography of Canadian Botany for the Year 1915. By A. H. MacKay, LL.D., F.R.S.C.

15.—Bibliography of Canadian Entomology for the Year 1915. By C. J. S. Bethune, D.C.L., F.R.S.C.

16.—Bibliography of Canadian Zoölogy for 1915 (exclusive of Entomology). By E. M. Walker, B.A., M.B., F.R.S.C.

17.—Bibliography of Canadian Geology for the Year 1915. By Wyatt Malcolm. Presented by R. G. McConnell, B.A., F.R.S.C.

18.—Some Further Observations on the Discharge of Spores in the Uredineae. By Professor A. H. Reginald Buller, F.R.S.C.

19.—Upon the Germination of the Spores of *Coprinus Sterquilinus*. By Professor A. H. Reginald Buller and S. G. Churchward.

20.—Structure of the Basin of Lake St. John. J. A. Dresser, F.R.S.C.

21.—Dysentery, and the Dysentery Bacillus. A Report of some Cases with Isolation of Organisms of the Shiga Group. By R. F. Kelso, M.D., and W. Sadler, B.S.A. Presented by F. C. Harrison, F.R.S.C.

On the motion of Dr. Faull, seconded by Dr. Buller, the report of Section IV was adopted.

The President gave a verbal report on the interview of the delegation with the members of the Government. He stated that the committee waited upon the Honourable Sir George E. Foster, Minister of Trade and Commerce, and Honourable Sir Thomas White, Minister of Finance, on the morning of the 18th May. The deputation was received with marked consideration. The sympathetic attention of the Government was promised to the representatives of the Society and Sir George E. Foster stated that the matter had been under consideration by him for some time and he was prepared to report to the Government at an early day.

The report of the Nominating Committee was then presented by Dr. Klotz. The following nominations were made:—

President—Dr. A. B. Macallum.

Vice-President—His Honour Mr. Justice J. W. Longley.

Hon. Secretary—Mr. Duncan C. Scott.

Hon. Treasurer—Dr. C. Gordon Hewitt.

Hon. Librarian—Mr. D. B. Dowling.

It was moved by Dr. Klotz, seconded by Dr. Coyne, that the report of the Nominating Committee be received and adopted.—Carried.

It was moved by Mr. Lambe, seconded by Dr. Ellis, that the following Fellows constitute the General Printing Committee of the Society:

Dr. Sulte, Mr. de Montigny, Dr. LeSueur, Dr. Plaskett, Dr. Shutt, Dr. Prince, Dr. Hewitt, Mr. Dowling and Mr. D. C. Scott.—Carried.

It was moved by Mr. Burpee, seconded by Dr. Coleman, that the thanks of this meeting be presented to the officers of the Society and the other members of the Council for their very efficient services during the past year.

The meeting was then declared adjourned by the newly elected President.

APPENDIX A

PRESIDENTIAL ADDRESS

CANADA'S INTELLECTUAL STATUS AND INTELLECTUAL
NEEDS

BY

ALFRED BAKER, M.A., LL.D., F.R.S.C.

CANADA'S INTELLECTUAL STATUS AND INTELLECTUAL NEEDS

Fellows of the Royal Society of Canada, Ladies and Gentlemen,

I recall vividly my trepidation on the occasion of my first speech before an undergraduate debating society, and I have not forgotten with what hesitancy I commenced my first lecture as a lecturer in my University. To-night I take refuge in the paradoxical thought that one of the first qualifications in any attempt to discuss a subject is the sincere and unaffected conviction of inability to do it justice. An old friend of mine, a politician of some experience, was on a platform at a ward meeting with a young fellow who had for the first time to address such a public on the tariff question. The young man said to him, "I'm so nervous about my speech; I really do not seem properly to know my subject." His senior answered, "Recollect, my friend, how much less these people know than you do, and you'll soon get confidence." But no such assurance can come to one who finds himself addressing a Royal Society. If, however, life is greyed by a sense of one's unworthiness on exigent occasions, it is brightened by the thought of the charity of one's confrères; and the generosity which honoured me with the distinguished office of President of the Royal Society will condone the shortcomings of my Presidential address.

Professor Frank D. Adams in his admirable Presidential address in Montreal in 1914 discussed Canada's physical resources and their proper conservation. I have selected as my subject Canada's intellectual status and Canada's intellectual needs. The subject is a broad one and in some respects intricate or vague; some phases of it without doubt will escape me, and some I shall deliberately avoid. I make no pretense to an exhaustive discussion. To anyone attempting an analysis two divisions will present themselves: first, the general intellectual condition of our people, as indicated by various existing institutions, and the influences affecting this condition and these institutions; and secondly, the way in which and the extent to which Canada has contributed or could and should contribute to the scientific, literary and artistic assets of mankind. Under this latter heading fall scientific research, important literary work, etc.

I.

It may possibly clear the air somewhat in considering the former heading, our general condition, if I suggest that in the matter of their mental equipment there are intellectual people with intellectual tastes and unintellectual people with intellectual tastes. If to these we add intellectual people without intellectual tastes and unintellectual people without intellectual tastes, and if we remember that these classes shade into each other, it will be found that we have pretty exhaustively classified ourselves. Much importance is to be attached to the cultivation of intellectual interests. Indeed we may regard such a process as constituting a large part of education; education scarcely makes people intellectual; that is the work of nature; and it is the duty of the best minds of a nation to create, encourage and promote institutions and influences that will stimulate intellectual interests. There is hardly an occupation, however humble, that does not present an intellectual view point; there is hardly an occupation, however humble, that has not for those who pursue it an educative value; there is hardly an occupation, however humble, that may not make those who pursue it more contented with their lot by reason of the interests associated with it. There is a certain levelling or equalising effect in all this. You and I have met lawyers, doctors and engineers who pursued their profession as a trade; and you and I have met mechanics who pursued their trade as a profession. I have no intention to-night of pointing out how agricultural colleges, technical schools, public libraries, and museums may be used to secure economic advantage, to make money, though I am quite convinced the intelligent pursuit of a calling is materially the best. I am thinking only of the bearing of such influences as I shall refer to, on the intellectual advancement of the nation.

You will agree with me, I believe, that quite apart from their spiritual mission, the churches exert a powerful influence on the mental vision of our people. The exposition of the ethics of Christianity, merely as a system of philosophy, must profoundly affect and stimulate the thoughts of a nation. It is not necessary that here I enter further into detail. I content myself with saying that the observance of the moral principles set forth in the Sermon on the Mount marks a higher civilization than the presence of physical and chemical laboratories, or than the farthest penetration of science into the secrets of nature.

I begin with a brief discussion of education, using the word in its conventional and restricted sense. My enquiry, however, is chiefly concerned with influences at work amongst our people after leaving school.

EDUCATION

I have no intention of discussing the schools and colleges of the Dominion. For, however pertinent such an enquiry might be to the matter I am dealing with, justice to the enquiry would take me quite beyond the bounds of such a paper as the present. I may be permitted notwithstanding to offer a few observations on the education of our people.

It is satisfactory to note from the census returns of 1911 that illiteracy in Canada, in the ten years from 1901 to 1911, decreased from 14.39 to 10.50 per cent of the population of 5 years and over; and that the decrease occurred in every province of the Dominion. In 1911 illiteracy varied in the provinces from 6.51 per cent in Ontario to 14.05 in New Brunswick. The percentages of illiteracy in the various provinces only in part correspond with the percentages of population of European birth, for New Brunswick has the lowest percentage of European birth with the exception of Prince Edward Island. On the other hand, it seems that a certain amount of illiteracy is to be ascribed to European immigration, for Saskatchewan, and Alberta, which rank next to New Brunswick in illiteracy, have the highest percentages of population of European birth with the exception of British Columbia. This characteristic of British Columbia, which places it below the other western provinces in illiteracy while it exceeds them in percentage of population of European birth, is doubtless due to the fact that a large part of its immigration came from the British Isles. A large proportion of the Ontario population of European birth also came from the British Isles, thus keeping down its percentage of illiteracy. The following table on which these statements are founded may be of interest, the figures being percentages:—

	Illiteracy	European Birth
Canada.....	10.50	17.81
P. E. Island.....	7.61	1.75
Nova Scotia.....	10.34	6.87
New Brunswick.....	14.05	3.70
Quebec.....	12.66	6.30
Ontario.....	6.51	18.13
Manitoba.....	13.31	38.32
Saskatchewan.....	13.70	35.35
Alberta.....	12.72	34.98
British Columbia.....	11.61	47.29

It is not easy to compare Canadian illiteracy with that of other countries for the reason that Canadian statistics include individuals of five years and upwards, while in almost all other countries ten is the

minimum age. In the United States the percentage is 7.7, varying from 1.7 in Iowa to 29 in Louisiana. In Australia the percentage is 1.8, where, however, the basis is inability to read.

Much good might be done by extending the influence of our educational institutions beyond their immediate environment to a greater extent than is attained at present. Every lecturer in a university is not capable of popularising his subject, not is every subject in a university curriculum capable of popularisation. Some university lecturers, however, have so much native strength and individuality as not to become waterlogged with their subject. They perceive instinctively the essentials for popular presentation, and in voice and manner are fitted for delivering public addresses. Not only is a vast body of literature, history and philosophy suitable for conversion into the small change of public courses, but a great deal of science can also be offered in the same form. I have already referred to the presence in our communities of intellectual people without intellectual tastes and unintellectual people with intellectual tastes. They are of more frequent occurrence than is generally supposed. The former class can have their tastes transmuted, the latter theirs stimulated. For all such university extension lectures have a special mission. The university extension movement has received in Canada but little attention, and what attention it has received has been of the most sporadic character. In England it has been energetically pushed and with good results. Several of the universities of the United States have been radiant points for this form of intellectual energy; and special lecturers have devoted their entire attention to extension work. Surely the universities of Canada might enlarge their area of usefulness in a similar way.

But this work need not be confined to universities. Amongst the specialists in our collegiate institutes and other homes of secondary education we have many accomplished and scholarly men. It would be of advantage not only to the communities in which they dwell but also to themselves if their accomplishments and scholarly attainments were displayed beyond the walls of the school room. Many centres for so-called extension lectures could thus be created, and the intellectual life of Canada would be widely stimulated. Central committees in each province, putting themselves in touch with universities, colleges, and collegiate institutes, could create an organization that would assist in arresting the mental declension that so often begins with school-leaving or graduation from a university.

A Plea for the Increased Study of French. A short time since when examining the notice of a certain university professor in Morgan's "Canadian Men and Women of the Time," I found ascribed to him

the opinion,—“Believes that every Anglo-Canadian should be able to speak French.” My exclamation was,—“Extremely sensible; he thinks as I do.” In the Report of the Ontario Minister of Education for 1913 I find the following statistics respecting the total attendance in the collegiate institutes, high schools, and continuation schools of Ontario, and the numbers taking the various languages studied: attendance, 39,290; French, 25,969; German, 5,219; Latin, 28,644; Greek, 602. You see that Greek even as a dead language, is undergoing a further process of mortification. You note further that five times as many take French as take German, though practically in the secondary and university curricula the same importance attaches to both: pupils take French by preference. You further observe that Latin is the language studied by the greatest number. Yet of the twenty-eight thousand six hundred taking that language scarcely half a dozen, after leaving their schools or universities, will ever lift a Latin book for the pleasure of reading it. They take Latin because it is a necessary part of the curriculum without an alternative. One naturally asks is the study of Latin the most profitable language study that could engage their attention. Of course for the most part those who are studying Latin are studying French also. I believe, however, that in the vast majority of cases the mental energy consumed in assimilating the elements of Latin would be better employed in adding to their knowledge of French, so that they would have an easy reading knowledge of it. Even if no sacrifice of Latin were made I believe an increased attention to French by our English-speaking population would augment our intellectual assets. French is the one language other than English that is spoken to any notable extent north of Mexico. It is spoken by over two million Canadians. It gives access to vast stores of scientific knowledge. It is the open sesame to a marvellous literature. Of the languages named it is the one most easily acquired by one whose native tongue is English. It is the language of our Dominion Parliament and of our Royal Society equally with English. It has in a remarkable way influenced English literature. It is of assistance in acquiring other Romance languages. As a minor matter, in that it does not concern any large body of our people, it is valuable in European travel. Facility in two languages is supposed to and does give a mental flexibility of distinct educational value. To speak in two languages with us is almost monopolised by French-Canadians. Why should not so great an intellectual asset be largely cultivated by other Canadians. France is possibly approaching the most brilliant period in her wonderful history, her most splendid triumphs in science, in literature, and in art. The relations of the British Empire with France will be

more intimate and more cordial than they ever have been. The interchange of thought between the two peoples will be more constant and more influential. Reciprocal travel and reciprocal trade will increase. The study of French should be extended in our English-speaking schools. In all our public libraries there should be shelves filled with the classic and best current literature of France. French journals and reviews should be found in our reading rooms. I venture to make the claim that from whatever viewpoint we regard the question, literary, scientific, linguistic, national, selfish, altruistic, imperial, provincial, parochial, material, spiritual, intellectual,—increased cultivation of the French language and French literature will add much to Canada's assets.

THE PRESS

It may be of interest to know that there are 1,445 newspapers and periodicals of various kinds published in Canada. I have made no attempt to ascertain the aggregate circulation or alleged circulation, but it is pretty certain that of the million and a half of households in Canada there are few into which a daily or weekly newspaper does not go. The daily newspapers of course are published in the cities; the weekly and semi-weekly in the towns, or, if published in the cities, are religious or trade journals, or are the representatives of special interests. The monthly issues are magazines or the representatives again of special interests. As to the quality of our newspaper literature I can safely say we get all we pay for. It is a truly extraordinary fact that every morning I can have laid before me, for the trifling sum of \$4.00 a year, the news of the world, to say nothing of energetically enforced suggestions as to how my political views should shape themselves. The criticism usually passed on our Canadian newspapers is that the limited staff employed, even on the best of them, is expected to write on too great a variety of subjects, and that the writing in consequence lacks that quality which can be supplied only by a specialized and intimate knowledge of the subject dealt with, a quality which we do find in the best London and New York dailies. In fact they are in the same position in which our Canadian universities were some years ago, when there was one professor with an assistant for the vast subject of modern languages, or classics, or mathematics, and when notwithstanding such professor with his assistant was struggling to maintain the institution's curriculum at a high level.

Two Canadian magazines are conspicuous by reason of their merit,—“The University Magazine” and “La Revue Canadienne.” The inundation of the country with the short-story magazine is in a

sense calamitous. It draws the attention of the people from the higher forms of literature. It is the substitution of elementary sketches, often exceedingly crude though at times ingenious, for the higher forms of art. I have seen fifty different magazines, almost all imported, on the counter of a newsdealer. The short-story magazine and the moving picture drama of gesticulation are influential in lowering the public taste.

I have said there are 1,445 newspapers and periodicals of various kinds published in Canada; of these 140 are daily, 1,056 weekly or semi-weekly, and 249 monthly or semi-monthly. In language, 1,322 are English, 88 French, 8 German, 6 Ruthenian, 5 Icelandic, 4 Italian, 2 Polish, 2 Yiddish, 2 Japanese, 1 Norwegian, 1 Swedish, 1 Norwegian and Danish, 1 Hungarian, 1 Hindustani and English, and 1 Chinese. The following table may be of interest:—

In Canada 1 newspaper or periodical is published for every						4,987 inhabitants
" P. E. Island	"	"	"	"	"	6,695
" Nova Scotia	"	"	"	"	"	6,478
" New Brunswick	"	"	"	"	"	7,038
" Quebec	"	"	"	"	"	14,412
" Ontario	"	"	"	"	"	4,171
" Manitoba	"	"	"	"	"	3,121
" Saskatchewan	"	"	"	"	"	2,751
" Alberta	"	"	"	"	"	3,046
" British Columbia"	"	"	"	"	"	3,504

As there is nearly the same percentage of illiteracy in the various provinces, and as therefore the same amount of newspaper reading is likely, it is probable that the above figures are associated with the average circulation. Thus I find that in Quebec one newspaper or periodical out of every three has a circulation of 5,000 or more, in Ontario, one out of every six, in Saskatchewan, one out of every twenty-two. The scattered life of the West demands more newspapers in proportion to the population than the East, even at the expense of circulation. Manitoba is evidently our most polyglot province with 4 French newspapers, 4 German, 5 Icelandic 5 Ruthenian, 2 Polish; 1 Swedish, 1 Norwegian, 1 Yiddish, and 1 Hungarian.

When we consider the disturbing influences in a daily newspaper office where most of the writing is done, the rapidity with which it is done, the daily demand on the powers of the various editors, the variety of subjects on which they are expected to be illuminating, we are amazed that the quality of the work is as good as it is. We deplore the bitterness of the Canadian newspaper towards its political opponent; we regret the rarity of those occasions on which it takes a judicial attitude towards the opposite party; we lament its refusal

to praise the praiseworthy acts of those against whom, in power or out of power, it struggles; we can, however, say of our press that in the subjects it selects for discussion, and in its treatment of them it is reputable, and that there is scarcely a paper published in the country which cannot with confidence be introduced into any household and read by the members of the family. In their support of and sympathy with the Empire in the titanic struggle in which it is engaged the press of Canada is actuated by the highest patriotism.

PUBLIC LIBRARIES

The disposition to collect records and books is as old as records and books. Libraries are as old as and co-extensive with civilization; indeed we must regard the presence of libraries as an essential characteristic of civilization. The establishment, however, of public libraries by municipalities, free and open to all the citizens, is of comparatively modern date. The Public Libraries Act of England was passed in 1850, and was largely due to the energetic intelligence of a Scotch member of the House of Commons. The presence in a community of any considerable number of well selected books, easy of access, must exercise on the mentality of the people an admirable influence, provided the books are used. It is often said that libraries exist to provide positions and salaries for librarians; that the books are but little used; and that such as are used are works of fiction. It must be remembered that works of fiction in most public libraries have been selected with a certain degree of care, and with a certain sense of responsibility. In the public libraries of Ontario there are twice as many books belonging to the non-fiction class as to the fiction class. It is not easy to obtain statistics as to the circulation of books of these respective classes; I have the figures, however, for 1915 for the Toronto library. There the number of non-fiction books taken out for home reading was 175,903, and the number of reference books used (which of course are non-fiction) was 209,594, making a total of 385,497; while the number of works of fiction taken out for home reading was 446,802; so that the circulation in these classes for adults was non-fiction, 46, and fiction, 54 per cent respectively,—not a great disparity. The juvenile circulation for the same year in the Toronto library is most interesting and instructive. In this class the number of books taken out for home reading was 249,260, and amongst them fiction was scarcely represented; they were works on travel, biography, history, literature, fine and useful arts, popular science, myths, and legends. The juvenile circulation in works of reference is represented by 146,536, the books being consulted in preparation for school debates, essays, compositions, etc. We thus

have the interesting and not unsatisfactory conclusion that the children of Toronto are doing more substantial reading than their seniors. You will be pleased to learn that in the same city the juvenile circulation has increased three fold in two years, having risen in that time from 85,000 to 250,000. I doubt not that in other parts of the country, where efforts are made to interest children in the use of books, the same story is repeated. These facts speak volumes for the increased intelligence of the rising generation, and for the intellectual influence of the public library.

As for the extent to which the public libraries are used by the people who have access to them, the Report of the Inspector of Libraries of Ontario for 1913 shows that on the average each man, woman and child in Ontario reads 2.68 books in the year; that, if we consider only those who used the libraries, each individual read 19.8 books in the year; and that on the average each book in the libraries was read 2.67 times.

The preceding facts relate to public libraries in Ontario. I have selected that province because there the public library system is highly developed. The people of the neighbouring Republic are justly proud of their public spirit, their public institutions, and especially of their public libraries, but in no state of the Union, I believe, is the library system as advanced as in the Province of Ontario. The total number of public libraries in Ontario is 409 (not including school libraries); the aggregate number of books is 1,571,214; the total assets in books, buildings, etc. is \$3,721,929. In Ontario, very wisely, the Legislature has placed the public libraries under the direction of the Department of Education, thus making them, as they should be, part of the educational system. The Legislature and the municipalities and counties make grants to them. There is an Inspector of Public Libraries, who also reports on historical, literary, and scientific institutions in the Province. There is an Ontario Library Association, corresponding to the Ontario Educational Association; its annual meetings have an attendance of nearly 200, and at them matters are discussed and papers read of interest to librarians. In addition the Province is divided into fifteen districts, and the representatives of libraries in each district are organized into a Library Institute whose yearly meetings do much to promote intelligent co-operation. There is a Summer Library School. There has been established in Toronto a free library for the blind, with nearly 4,000 volumes, and about 1,400 pieces of music. Several hundred travelling libraries are sent out every year. The Carnegie gifts to Canada amount to nearly \$3,000,000, and of this large sum approximately \$2,000,000 has gone to Ontario. There are in Toronto

and elsewhere in Ontario many libraries which cannot be described as public, *e.g.*, those in the universities, colleges, etc. In Toronto there are eighteen such libraries with, in the aggregate, about 500,000 volumes.

The value of the intellectual asset to be found in public libraries seems to be scarcely appreciated in the other provinces as it is in Ontario, though I believe in several provinces legislation has been or is to be introduced following the lead that has been set by Ontario.

In Prince Edward Island there are two public libraries of importance, at Charlottetown and Summerside.

In Nova Scotia the libraries have not been placed under the direction of the Department of Education, and therefore seem lacking in the advantages which organization, or at least such an organization would impart. In the school libraries there are 62,564 volumes. In the city of Halifax there are twelve libraries with an aggregate of over 100,000 volumes, one of these being the Citizens' Free Library with 24,000 volumes. In eight other towns there are libraries, for the most part open to the public, with an aggregate of about 50,000 volumes. I believe the private libraries in Nova Scotia contain valuable collections of books, and represent perhaps the intellectual asset of the Province in this regard.

In New Brunswick the libraries are not under the control of the Department of Education. There are two in the Province, the Public Library at St. John and the Legislative Library at Fredericton. In addition various libraries are maintained by subscription, and many school libraries have been established.

In Quebec the institutions which virtually fall under the definition of a free public library are the Fraser Institute Library of Montreal, the Westmount Library, the Montreal Free Library in course of construction, the Public Library of Waterloo, and the Library and Art Union of Sherbrooke. There are in addition thirteen libraries, chiefly those of the universities and colleges and of the literary and scientific societies. The libraries of Montreal contain at least 500,000 volumes; those of the city of Quebec 269,218 volumes. The new Montreal Free Library is designed to be in every way worthy of the great city in which it is situated. Several of the libraries of Quebec contain most valuable archives, notably those of St. Mary's College, the Seminary of St. Sulpice, and Ecole Normale Jacques Cartier of Montreal, and of Laval University, Quebec. In the Legislative Library are the famous Washington Papers, complete from 1775 to date; and in the Laval University Library are about 30,000 original manuscripts relating to the history of Canada under the French régime,—What a mine for historical research and for writers of his-

torical novels! These documents are of interest to the scholar rather than to the general public.

In Manitoba there are two public libraries, that of Winnipeg consisting of one central and two branch libraries, and that of Selkirk. The former contains 125,000 volumes, buildings and books being valued at \$304,000; the latter contains about 5,000 volumes, the building being valued at about \$10,000.

In Saskatchewan there are ten public libraries, that at Regina being the largest with 14,725 volumes of which 6,282, or nearly 43 per cent are fiction. The circulation at Regina for 1914 was 105,949, so that each book on the average was taken out about 7.2 times, which is an excellent showing, somewhat marred perhaps by the fact that of the works taken out by adults about 74 per cent were fiction, and of those taken out by juveniles about 70 per cent were of the same class. It is interesting to note that at one of the branch libraries in Regina provision is made for the foreign population; the circulation numbers record 2,840 German books, 397 Russian, and 181 Roumanian. Special efforts are made at Regina to interest the school children in the library, and to induce them to make use of the books. In every way the institution seems to be admirably administered. I have not been able to obtain statistics with respect to the nine other public libraries in Saskatchewan. The Public Libraries Act of Saskatchewan is an enlightened piece of legislation, and is destined to make the libraries an important educational influence, though their organization as a provincial system appears as yet incomplete.

Alberta has but two public libraries, those at Calgary and Edmonton, the beginnings at other places being regarded as negligible. The Calgary library has 25,977 volumes with buildings valued at \$105,000; the Edmonton library has 35,192 volumes with buildings valued at \$40,000. In Calgary about 71.2 per cent of the books taken out by adults, and about 57.7 per cent of those taken out by juveniles are fiction. Juvenile books lent are about 24 per cent. of the whole. In Edmonton about 79.5 per cent of books taken out by adults, and about 71.9 per cent of those taken out by juveniles are fiction. Juvenile books lent are about 17 per cent of the whole. In 1907 the Legislature passed a Public Libraries Act, modelled closely on that of Ontario and permitting the levying of a municipal library tax which must not exceed one mill on the dollar of assessment. Up to the present but little use appears to have been made of the Act; and though the libraries at Calgary and Edmonton are well administered, there seems to be no provincial library system, nor does there seem to be an official recognition of public libraries as part of the educational system of the Province.

While up to 1913 British Columbia had no provincial library act, it had a Library Association which sought to promote in the Legislative Assembly legislation similar to the Ontario Library Act. There are public libraries at Victoria, Vancouver, New Westminster, Nelson, Kelowna and Vernon. British Columbia has had since 1898 a travelling library system, maintained by the Provincial Government especially to meet the needs of agricultural and mining communities. I regret that I have been unable to obtain from British Columbia, in reply to my letters, further details respecting its libraries.

In making this somewhat hurried review of the libraries and the library systems of the Dominion one cannot but be impressed by the really admirable way in which the public library has been developed in Ontario; and, with its Library Association, its Library Institutes, its official inspection, its plan of legislative and municipal grants, its 409 public libraries, and its other characteristics of organization, by the way in which it has come to be clearly recognized as an integral part of the educational system of the Province. There is something very fine in the thought that in the Free Public Library the poorest man in the community has opportunities for intellectual gratification or indulgence which could not be added to by the possession of wealth. In a democracy such as we have in our Empire we should constantly struggle to make the higher forms of pleasure possible for all. No one will find fault with such a socialism. If we accept the American application of the term graduation to ordinary school-leaving, we have in the public library the possibilities of post-graduate study. Whatever intellectual interests may have been created at school, or may have germinated after leaving school, may be indulged by utilizing these stores of literature, science, and art. It is pleasing to know that these libraries are being increased in number and are being increasingly used; it is pleasing to know that the rising generation are using them more than their parents do; and it is pleasing to know that the more substantial forms of intellectual interest appeal increasingly to the rising generation.

TECHNICAL EDUCATION AND EDUCATION IN AGRICULTURE

It is here convenient to lay down a series of propositions which everyone will be more or less prepared to admit:

1. It is desirable that education should be continued after leaving school.
2. The individual is largely influenced intellectually and educated by his occupation, or should be.

3. The majority of occupations in life admit of an intellectual viewpoint and treatment.

4. The pursuit of an occupation merely and solely for monetary gain is utterly destructive of whatever higher qualities or opportunities may reside in the occupation.

5. The scientific, artistic, aesthetic, or economic theories or facts at the base of or associated with any occupation constitute its intellectual side and create its educational possibilities.

6. Technical education is an effort to develop the scientific, artistic, aesthetic or economic theories or facts associated with various callings.

7. The scientific treatment of agriculture is unlimited in its possibilities, and the pursuit of this calling therefore has great educational opportunities.

8. Agriculture will always directly employ more than half of Canada's population.

9. In keeping the scientific, artistic or aesthetic view-point of an occupation before those who follow it, we are not interfering with their opportunities for material gain.

Each of these propositions is a text from which I might speak at considerable length: they all unite in emphasizing the value of and justifying technical and agricultural education. How many opportunities for the exercise of the artistic faculty has the cabinet maker and the designer. How many chances for the exercise of ingenuity, that highly intellectual quality, are enjoyed by machinists, and how often have they suggested improvements in machinery. One turns away from the contemplation of a great modern printing press with a feeling of wonderment at human ingenuity somewhat akin to the emotion with which we regard the mechanism of the solar system, and Laplace seems to have had some such analogy in mind when he gave his great work the title "*Mécanique Céleste*." The farmer has in his acres a laboratory of a very wonderful character. The sciences of chemistry, botany, and entomology are all enlisted in his interest. It is remarkable that farming should be regarded by some as an occupation for unskilled labour. It is possible for the farmer to have at least a superficial acquaintance with the bearing of these sciences on his calling, and even such superficial acquaintance raises the character of that calling. The navigator makes a constant use of astronomy, though he could not begin to form or solve the differential equations from which his tables are derived.

When technical and agricultural education are spoken of, it is usually in connection with the increase in our material resources, and with our ability to maintain competition in the markets of the

world. I am thinking and speaking to-night not of material advantages, but of the effect of these forms of education on the general intelligence of our people. Pre-vocational education no doubt makes the workman more efficient, but it also makes his subsequent occupation a species of post-graduate career with educational opportunities. The effect of this is to make a man see more in his calling, and to be more happy and contented in it,—to give a more thoughtful cast to his mind. The effect will be to keep the farmer on the farm, not because he cannot get away from it, but because his education has broadened and deepened his interest in his profession, and afforded him a variety of thought quite equal to that which a town life could supply.

I proceed to consider, in a hasty way, I confess, the extent to which technical and agricultural instruction has been introduced into our various provinces. Both forms of education have received a certain development throughout the Dominion though giving evidences of recent initiation. In both cases provincial legislative enactment has been fairly general. Technical education has naturally received most consideration in those sections where manufacturing and mining are carried on; agricultural education is promoted in those places where agriculture seems destined always to remain the chief occupation of the people: the former seems somewhat sporadic and wanting in organization though two splendid illustrations of interest in it are found in Toronto and Montreal; the latter seems very wide-spread and public interest in it better mobilized; the former makes its earliest appearance in manual training; the latter in nature study, school and home gardens, and school fairs.

I reserve for subsequent consideration reference to experimental agricultural stations which belong to the field of scientific research.

In Prince Edward Island pre-vocational training is confined to short courses in agriculture conducted by the Department of Agriculture. There is a Director of Agricultural Instruction. Three hundred teachers out of a total of five hundred and ninety-five were paid bonuses in 1914-15 to encourage the furtherance of the work. Last year a course of two weeks was held in Charlottetown with an enrolled attendance of 220. There was a longer course extending over four months with a smaller attendance. While there is a branch experimental farm there is not in the Island an agricultural college.

In 1907 the Legislature of Nova Scotia passed the Act creating the Technical College of Nova Scotia and providing for the establishment of local technical schools. Schools of instruction for miners had been provided for under the Act of 1900. The Rural Science School is affiliated with the Provincial Normal and Agricultural

Colleges at Truro, and grants diplomas in rural science, courses being offered in nature study, biology, botany, gardening, and horticulture, agriculture, physics, chemistry, bird and insect study, bacteriology, geology and mechanical science. The study of rural science has been much encouraged by the Agricultural Instruction Act, passed by the Dominion Parliament, which has supplied the financial assistance needed. Last year 109 diplomas in agriculture were granted by the Summer School at Truro, which is the normal school for training teachers in Rural Science. In the public schools nature study and elementary agriculture have been well taught as reported by the Director of rural science schools. School fairs and exhibitions have been held, and much enthusiasm has been shown in the work. It is worth noting that the total attendance at the vocational schools (Normal College, Agricultural College, Technical College and Coal Mining Schools) in 1914 was 3,285 which compares well with a total attendance at the high schools of 8,903. In the mining schools, carried on in 17 different localities, there was a total enrolment in 1914 of 690. In the technical schools, other than mining, carried on in 6 different localities, there was a total enrolment of 1,560. Advanced work in agriculture is carried on at the Agricultural College, Truro.

An interesting subject to which no little attention is given in the schools of Nova Scotia, as being associated with nature study, is phenology which concerns observations on the times of the regular procession of natural phenomena each season, the leafing of plants, the opening of flowers, the return and departure of different kinds of birds in their migrations, etc. It makes children observant, and greatly increases their interest in nature.

In the schools of New Brunswick instruction is given in elementary agriculture. Attention is also paid to manual training and domestic science, though up to the present no technical schools as such have been established. There is a Director of elementary agricultural education to whose guidance are entrusted the nature study and rural science of the schools, and annual grants are made for the encouragement of the work. This has been made possible by the Agricultural Instruction Act passed by the Dominion Parliament in 1913. Rural science schools have been established for giving special training and instruction to teachers; and in 1915 one hundred and ninety teachers took the four week's course. In the schools a certain amount of elementary laboratory work is exacted, and each pupil must be provided with a small amount of apparatus for individual work. In New Brunswick no agricultural college has been established.

In 1899 the Legislature of Quebec enacted that "Agriculture shall be taught in all schools in rural municipalities." The enactment was until recently rather inoperative from want of properly trained teachers. Now, however, every teacher who receives a diploma from the Roman Catholic Central Board of Examiners passes an examination in agriculture and in methods of teaching it. In the Normal Schools similar qualifications are called for. Those taking their certificates from the Protestant School for Teachers, being a part of the Macdonald College, are competent instructors in rural science. It may be expected therefore that in the future agriculture in the schools of Quebec will be a live subject. Nature study is prescribed in the various grades of the schools.

In more advanced instruction in agriculture the needs of the Province are well ministered to. Four institutions devote themselves entirely to the teaching of the subject,—the Agricultural Institute of Oka (affiliated with Laval University), the Agricultural School of Ste. Anne de la Pocatière, the School of Agriculture of Macdonald College, and the Provincial Dairy School of St. Hyacinthe.

In Quebec there are three experimental farms, and experimental fruit stations in eighteen or twenty counties; though these belong to the region of research rather than to that of instruction.

To turn to technical education in Quebec: Manual training is not found in the rural elementary schools; in a few of the secondary schools there are excellent equipments and well taught manual instruction classes. In its institutions devoted entirely to technical education Quebec may well take a pride. The Montreal Technical School was erected at a cost of \$636,187, and "can bear comparison in all respects with any similar institution in the world," while the Polytechnic School in affiliation with Laval at Quebec, erected at a cost of \$405,359, is not far behind its sister institution. There are also technical schools at Shawinigan, Sherbrooke, and Beauceville. The total attendance at these schools at last report was 1,274. There is also the Montreal Technical Institute with an enrolment in evening classes of 1,425, amongst them being many employees of the Dominion Bridge Co., Northern Electric Co., Canada Car Co., Grand Trunk Railway, Light Heat and Power Co., National Bridge Co.; etc., "Ninety per cent of the electrical class are concerned with electricity in their daily work"; "ninety-five per cent of the classes in mechanical drawing are machinists, pattern makers, draughtsmen, etc." In the night schools conducted by the Provincial Council of Arts and Manufactures in eleven different places there was in 1914-15 an enrolment of 2,515. In the Montreal Polytechnical School

there was an enrolment last year of 155. It will thus be seen that in technical training Quebec has made an excellent beginning.

In Ontario in spite of the evident eagerness of the Department of Education to encourage the study of Agriculture, the public does not appear adequately responsive. In 1914 out of a total of 5,489 rural and village schools in the Province only 278 had formally undertaken to give instruction in agriculture. An increase from 33 such rural schools in 1911 to 278 in 1914 shows that public opinion is growing in favour of the work.

Nature study is so generally taken up that I find enrolled in it in the public schools 421,200 out of a total attendance of 480,243. Teachers' classes are held during five weeks in summer for public school teachers who seek the certificate in elementary agriculture, and for high school teachers who seek the intermediate certificate. In 1914 eight field agents were appointed. They visited the schools engaged in rural science work, assisted the teachers in practical work, spoke at Women's Institutes and at Farmers Clubs, organized school fairs, and taught in the summer model schools. In 1914 thirteen high schools had introduced agricultural instruction. Altogether 17,042 pupils took agriculture in the public and high schools of Ontario in 1914 of whom 13,867 were pupils in rural schools. "The chief hindrance to progress in the work is lack of informed public opinion." It is to be hoped that the organized energy with which the Education Department is pushing the work will be rewarded with success.

The admirable educational work of the Ontario Agricultural College is too well known to require notice here. Over two thousand students in 1914 received instruction there. While the great majority belong to Ontario, its reputation is shown by the presence of students from Japan, India, Spain, Argentine Republic, Russia, South Africa, etc.

The Dominion Experimental Farm at Ottawa is specially devoted to research work.

In manual training, which may be regarded as the earliest form of technical work, there were in 1914 in the schools of Ontario 84,376 pupils, of whom about 65,000 were to be found in the cities. This number (65,000) compared with the 13,867 taking rural science in the country schools, suggests that the cities of Ontario are taking technical education more seriously than are the rural districts regarding agricultural education. Evening technical and industrial classes are found in 34 cities and towns, and are doing a meritorious work. The Director of Industrial and Technical Education is of opinion, however, that while "evening classes will always be important as a means of supplementing other educational agencies, they cannot

be the solution of the problem of vocational training. Education to be effective should be continuous. We must, therefore, rely mainly upon day schools for the industrial education of boys and girls. Every public school should be a pre-vocational school in the sense that a pupil will find in it opportunities for discovering his aptitudes." Technical and industrial day schools are found at Brantford, Haileybury, Hamilton, London, Sault Ste. Marie, Sudbury, and Toronto, those at Haileybury and Sudbury devoting their attention especially to mining. The magnificent scale on which the Toronto Technical School is planned shows how seriously the people of the city are taking the question of pre-vocational education. In the session of 1914-15 the registrations in the day school numbered 1,030, and in the evening schools 2,981, and have since largely increased. Great freedom is allowed in the selection of a course of study, but eleven diploma courses are specially recommended, and are admirably arranged to prepare students for almost all forms of industrial activity. It has been well described as the people's university.

In Manitoba under the supervision of the Director of Agricultural education the interest in rural science in the public schools is increasing. In 440 schools the subject was receiving attention from 5,500 pupils, though this seems a small proportion where the total registration was 51,888, the Province being so largely agricultural. Out of 33 high schools and collegiate institutes, during 1914-15 five have added agricultural specialists to their staffs, and have introduced courses of a more advanced character suited to those engaged in farming. The work covered in two winters is similar to that taken in the first two years by students of the Agricultural College at Winnipeg. The growth of this movement means much in a region so distinctly agricultural as Manitoba, especially when it is remembered that the Province is chiefly dependent on its high schools for the academic training of its public school teachers. Summer schools create opportunities for qualifying teachers in rural science and manual training.

In addition to the Agricultural College at Winnipeg which is largely engaged in educational work, there are in Manitoba two experimental stations, at Brandon and Mordan, occupied with agricultural research.

In the chief centres of population much interest is shown in manual training. The expense of equipment is in many places a deterrent to any considerable advance in this subject. In Winnipeg, however, are two technical high schools, St. Johns and Kelvin, with a staff of about thirty instructors and with well equipped workshops.

In Saskatchewan in 1914 the Agricultural Instruction Committee was appointed by the Minister of Education, and to it has been largely entrusted the administration of rural science matters in the Province. On its recommendation two Directors of School Agriculture were appointed, who have organized throughout Saskatchewan "Rural Education Associations." About 1,700 teachers are members of these associations. Nature study and agriculture appear in some form in each grade of the public schools, and are a qualifying test for entrance to the high schools. The teaching of rural science by the natural science instructors has not proved entirely satisfactory, and teachers are encouraged to specialize in agriculture by taking the B.S.A. course of the College of Agriculture with the view of having efficient work in the high schools and collegiate institutes. The Agricultural Instruction Committee has in view the establishment of rural high schools in which agriculture, household science, and manual training would be given special prominence.

In addition to the Agricultural College of the University of Saskatchewan at Saskatoon, which is largely occupied with educational work, there are in the Province three experimental farms at Indian Head, Rosthern, and Scott which are engaged in agricultural research.

Saskatchewan being largely an agricultural province, it has not been thought necessary to establish highly organized technical schools as have been created in the East. Legislation, however, has been adopted providing for the encouragement of industrial training; and in the larger centres such as Regina, Saskatoon, Moose Jaw, and Prince Albert, industrial work has been introduced in the high schools and collegiate institutions.

In 1914 the Provincial Government of Alberta authorized a system of grants to schools to encourage instruction in manual arts and agriculture, and a provincial Director of Technical Education was appointed. Summer schools have been organized, and 350 public school teachers and twelve inspectors have qualified in the subjects named by taking a two summers' course. In 1916 provision is to be made for an attendance of five hundred teachers at the summer school. There are three agricultural schools in Alberta, at Olds, Claresholm and Vermilion, giving a two-year course; and during the winter of 1915-16 over three hundred are in attendance at these schools. Agriculture is an examination subject in the public schools, and a strong course in the same subject is required of all high school students taking second class work for the non-professional examinations.

In addition to the Agricultural College of the University of Alberta, which is largely occupied with educational work, there are

in the Province two experimental farms or stations, at Lacombe and Lethbridge, engaged in agricultural research.

Interest in technical education in Alberta is evidenced by a pre-vocational school at Calgary and a technical school at Edmonton.

The plan of the Education Department of British Columbia as to agricultural education includes:—Special training of teachers in rural science; special grants to teachers and schools where rural science is taught, and agricultural instructions in high schools. Summer schools have been established to give instruction in agriculture and manual arts, and in 1915 seven hundred teachers were in attendance at one held at Victoria. Teachers holding the diploma in rural science receive from the Provincial Government a grant of \$30 over and above their regular salary. Much attention is paid to the proper maintenance of school grounds; grants are made with this in view, and a nursery has been established for supplying trees and plants. Agricultural instruction is being introduced into the high schools where specialists are expected to do the teaching. This specialist will also be expected to conduct extension work in agriculture in the district in which the high school is situated.

There are experimental farms or stations in British Columbia at Invermere, Summerland, Agassiz, and Sidney engaged in agricultural research.

Manual training attracts much interest in the city schools but is not taken up in the rural schools. Night schools provide instruction in technical subjects. They are carried on at eleven different centres and attracted 3,733 students in 1914-15. The course in Mining is a very comprehensive one; that in electricity somewhat less so. Courses are also provided in mechanical drawing and in first aid to the injured.

MUSEUMS

It is curious that the word *museum* was not permanently assigned as a name to the institutions we call universities. In its original sense it meant a place dedicated to the muses, and secondarily, a place for study and the intercourse of learned men. The most important museum of antiquity was that of Alexandria founded in the third century before Christ. It contained cloisters and lecture rooms, and had botanical and zoological gardens attached. It received a subvention from the public treasury. It was indeed a university. However, the term *museum* has come to be restricted to institutions, educational it is true, but where the instruction is conveyed by illustrative objects.

The characteristic features of the modern museum are *specialization* and *classification*. Thus through specialization arise museums of botany, of zoology, of mineralogy, and geology; pathological, chemical, agricultural, industrial, and educational museums; museums of art and of archæology. Our annual fairs are museums and should be clearly recognized and insisted on as part of our educational system. The instructional value of a museum depends, however, on intelligent classification and arrangement. Thus in an archæological museum the object is to illustrate the development of civilization; and the arrangement should show the advance of mankind through the succeeding stone, bronze, and iron ages, as well as the progress within each of these periods. The archæological then becomes the historical museum and shows the growth of industries and inventions, the varying condition of the people, and the development of the aesthetic faculties. Thus history is restored, and succeeding generations of men, their habits, and psychology are better understood. We see how closely our primitive ancestors resembled the savage of to-day. In Sweden and Denmark the value of museums as an adjunct to historical teaching is recognized; school children are taken through the rooms and the meaning of the exhibits explained.

The museum is an important adjunct to artistic and technical education. It is not necessary to enlarge on the value of the Kensington Museum in this respect. It is of interest to know that the furniture manufacturers of Grand Rapids, Michigan, with intelligent enterprise, are forming furniture museums for the convenience of their designers. I have heard a gentleman, who should know what he is talking about, ascribe the great advance in American architecture and furniture designs to the educative influence of the Metropolitan Museum of New York.

Even large museums should seek to be strong in some special direction. Local museums should illustrate the history of the surrounding country, its geology, palæontology, flora and fauna, and whatever industries may be there pursued. In this way in agricultural sections the public mind could be most convincingly impressed with the value of scientific farming. The universities of Canada, with their scientific departments and medical and dental schools are fully alive to the importance of illustrative museums, and their enterprise in such matters is only restrained by the expense involved. Every high school and collegiate institute might well have a small museum illustrative, within limits, of the flora, fauna and geology of the district in which it is situated.

In the United States the Metropolitan Museum of New York is one of the great educational institutions of the nation. The Museum

of Fine Arts of Boston, the Museum of the Carnegie Institute of Pittsburgh, and the Field-Columbia Museum of Chicago are known beyond the boundaries of the Union. Important collections are found in Philadelphia and at San Francisco, San Diego, Santa Fé, Denver and St. Louis.

In Canada in forming collections in certain departments, *e.g.* archæology, history, technology, limitations will be imposed by reason of the exhaustion of the sources of supply, though no doubt money would do here what it has done for the Metropolitan of New York. Dr. Ami, in his report on the state of the principal museums in Canada, presented to Section C of the British Association for the Advancement of Science, 1897, gives details of five museums in Nova Scotia, two in New Brunswick, six in Quebec, thirteen in Ontario, one in Manitoba, one in Alberta, and one in British Columbia. Since then there have been added one in Manitoba, one in Saskatchewan and two in Alberta. These collections are largely scientific for university purposes, or illustrative of aboriginal archæology. The collection in the Chateau de Ramezay is historical. Since Dr. Ami's report the Royal Ontario Museum of Archæology has been founded. It has been made possible by the enlightened policy of the Ontario Government and of the University of Toronto assisted by the generosity of private citizens. The collection has been admirably arranged for instructional purposes by the Director, Professor Currelly, whose enthusiasm and accomplishments are destined to make this museum of great educational value.

The gallery of the Art Association of Montreal contains some excellent pictures, and its annual loan exhibition is of great interest. The Dominion Art Gallery of Ottawa and the Art Museum of Toronto are of growing importance.

Every town of importance in Canada should have, in addition to its public library, a museum and an art gallery. They form valuable adjuncts to the other educational institutions of the place; they help to direct the thoughts of the people to intellectual channels; and, as has been pointed out, technical museums may have an important bearing on industrial enterprise.

II.

Up to the present I have been speaking of influences or institutions that affect the general intellectual life of the people, or of large groups of the people, and that assist in raising that intellectual life to a higher level. But just as a man may amass wealth without creating any, so a people may attain a degree of mental excellence

without in any way adding to the intellectual assets of humanity,—may indeed be an intellectual parasite, supporting its mentality on the literary and artistic creations, on the philosophic analyses and generalizations, on the scientific discoveries of other peoples. It is needless to say that such a relation to the outside world cannot be satisfactory to a self-respecting people, though it almost always holds of the people of a new country. It becomes necessary therefore to consider to what extent Canada has added and in what way she may add to the literary, artistic and scientific assets of mankind. This concerns the writing of poems, dramas, novels, histories or essays of merit; the composition of operas or oratorios; the painting of pictures, carving of sculptures, raising of architectural monuments; great inventions; and the prosecution of scientific research with its infinite variety and vast importance. I believe all will agree with me that the more the general intelligence of the people is increased by those influences to which the previous part of this address had reference, the more likely are Canadians to distinguish themselves in literary and artistic creation and in scientific research.

It is not possible for me to cover so large a field as is included in this second part of my subject, and I content myself with an attempt at a presentation of certain of its phases.

CANADIAN LITERATURE

While the spread of interest in and knowledge of literature is to be classed amongst those influences which promote the general intelligence of our people, achievement in Canadian literature is so much added to the world's stock of intellectual accomplishment, and ranks with discoveries in science, important works of art and note-worthy mechanical inventions. A nation's literature is the expression of its superior minds in writing; and without such expression a people can scarcely make claim to distinction. When we are reviewing a people's title to consideration we almost always first recall its remarkable writers,—Corneille, Racine, Molière, Bossuet, Pascal, or Spencer, Shakespeare, Milton, Gibbon, Macaulay, Who is there that has not read with emotion Macaulay's surpassingly eloquent tribute to the literary glories of Athens. It may be said that in Canada at present we are engaged in something more important than the wooing of the Muses: we are opening up and putting in order a vast territory; the man who builds a railway (with the assistance of the tax-payers of course) is more important than he who writes a remarkable poem, or is the author of an epoch-making history. Or it may be said we have at our command the great literatures of France

and of Britain,—the greatest that human genius has created; and no political party will ask that a tariff wall be erected to bar out their importation. It may be said we are now battling with the powers of nature. Yet in Homer's time there must have been a strenuous struggle with nature; I suppose they decided it was an almost hopeless struggle—the *Odyssey* would suggest this—and out of hopelessness and a mystic interpretation of nature sprang the poem. Ours is not a hopeless struggle, and we will hardly, as a people, be accused of being mystics. In Iceland life must be elemental, yet a remarkable literature sprung from its barren, icy, wind-swept rocks; and a recent translator of the *Saga of Grettir the Strong* says that the Icelanders had been for a thousand years the most literary nation in the world, and that in their own special branch, story-telling, they had no rival except in the Old Testament. A superior people, if still barbarous and uncontaminated, naturally and instinctively takes to literature. We Canadians are not wholly barbarous and we are not uncontaminated. We are scarcely ingenuous enough to write *Sagas*. And yet, not always conscious of it, we are the characters in a vast unsung epic where forces greater than Cyclopean, or Titanic, or Jovian were conceived to be, are bound and made to do our bidding; where regions that before frowned with barrenness now smile with harvests; where some of the stablest supports of a great empire have been reared; and where two peoples, differing in race and language, have learned to struggle for the common good. Possibly here the poetry in our souls finds an adequate expression.

Posterity, however, will know nothing of the mute inglorious Miltons; and we must modestly remember that in this field of intellectual achievement we have not as yet excelled; indeed this Continent has not excelled. With diffidence and hesitancy I offer an opinion; but if I had to name the really distinguished literary men this Continent has produced I should name Edgar Allan Poe and Ralph Waldo Emerson, and then stop, ready of course to receive enlightenment. Great literary achievement for Canada lies in the future,—we hope. Were we asked in what way can it be encouraged or realized, I believe most of us would have no reply. The celestial phenomenon we call genius has no calculable orbit. We can only wait for its appearance. We can, however, struggle to maintain a certain intellectual level. We can hope that the balance of trade in mental products will not always be against us; that the time will come when we return to humanity something for the vast treasure we have received. We speak of a country as advantageously placed which is self-contained, which has within itself everything necessary for its physical well-being. In like manner it is desirable that a people

enjoy a certain literary independence, though not desirable that it content itself with its own products to such an extent as to become narrow and provincial. One or two writers of surpassing merit in English or French would help to give us political cohesion, and impart to the two dominant races that intellectual influence which makes for unity, and against which no third race could long or successfully struggle.

Let me not be misunderstood, I clearly recognize the presence in our midst of much literary talent; and our imperial political outlook will always protect our literature from narrowness and provincialism, which in itself is an element of greatness. Canadian poetry is full of promise; and possibly so far as we have a Canadian literature, it is poetical. Poetry with us seems to precede prose, in this respect following a recognized law of evolution, though we did not start our national life from a condition of barbarism. The charm of untamed nature which here gives such inspiration, I conjecture, explains it; and explains also such success as has been reached in landscape painting. I have sometimes thought that French-speaking Canada was fated to win our literary laurels, while English-speaking Canada would gain whatever achievements might be ours in science. Concentration of effort makes for success, but I fear we can hardly arrange such a division of labour.

The general conclusions I reach with respect to Canadian literature are that it is in a formative state; that poetic literature promises much; that there is amongst us no dearth of literary talent, though we cannot claim to have contributed to world literature; that we look forward to the production of works of genius, unless the future has in store for us an elevated, somewhat wide-spread democratic equality with no great, outstanding luminary; finally, I pray that we do not resign ourselves to the development of our physical resources merely, for our intellectual needs importing from those places which can best or most economically minister to them,— which would be a *reductio ad absurdum* of the free trade theory.

AGRICULTURAL RESEARCH

When we remember that the science of agriculture is intimately associated with the sciences of Chemistry, Botany, Entomology and Bacteriology, and when we further recall the great varieties in climate, soil and other conditions that so vast a country as Canada offers, we see that numberless problems demanding the most careful scientific research must constantly present themselves. The greatness of our agricultural interests, the fact that our farm products are in value

almost four times the combined products of our forests, mines and fisheries, makes the solution of these problems of paramount importance. This was recognized by the Act of 1886 which authorized the Dominion Government to establish a system of Experimental Farms. The results of their work form a distinct contribution to human knowledge. Research in agriculture, as conducted at these farms, is the only illustration on a large scale of systematic scientific research that we have in Canada to-day. Valuable scientific research is systematically pursued at the various fishery stations, but it is of lesser proportions. There are in Canada to-day the Central Experimental Farm at Ottawa and eighteen Branch Stations, one on Prince Edward Island, two in Nova Scotia, one in New Brunswick, three in Quebec, two in Manitoba, two in Saskatchewan, two in Alberta, and four in British Columbia. There are also six sub-stations, chiefly towards the northern boundaries of the areas that may be cultivated. The Central Farm at Ottawa is equipped with chemical, botanical, entomological and bacteriological laboratories with a staff of trained men, and is adequate to enter upon the solution of the various problems that present themselves. The farm of 465 acres affords opportunity for conducting experiments in field and animal husbandry. Many stations scattered over the Dominion are necessary by reason of the numerous problems presented by so vast a country with so varied a climate.

The following are illustrations of problems attacked and of problems solved at these experimental farms: It has been shown that by continuous grain growing the soil lost to a depth of eight inches more than 2,000 lbs. of nitrogen per acre in twenty-two years. The merits and economy of different crop rotations have been tested. The amounts of nitrogen extracted from the air and stored in the roots, stems and foliage of various leguminous plants have been determined; and the increase in crops succeeding them has been noted. By cross-breeding varieties of wheat of high quality have been produced which ripen early and which, therefore, are adapted to the northern wheat-growing areas of the Dominion; one of these varieties ripens three weeks earlier than the famous Red Fife. By cross-fertilizing, hardy varieties of apple-trees have been produced, capable of enduring the severe winters of the Northwest. The organisms so disastrous to economic plants and trees have been studied, and means for their control have, within limits, been arrived at. Experiments have been made in the destruction of injurious insects by innocuous parasitic insects. The amount of the fertilizing nitrogen compounds introduced into the soil by rain and snow has been determined for some localities. These are but a few of the subsidiary problems that have

been worked out by our experimental farms in the vast problem of scientific agriculture. We can claim that at least in this form of research Canada is not parasitic.

BIOLOGICAL BOARD OF CANADA

Possibly next in importance to the work of the Experimental Farms, as a branch of scientific research, come the investigations prosecuted under the direction of the Biological Board of Canada. The name of the Board suggests that ultimately its research may be pursued in many different directions, but up to the present its work has been confined to our marine fisheries, its stations being at St. Andrews on the Bay of Fundy and at Departure Bay in British Columbia, with several sub-stations. These investigations are necessarily slow and may extend over a period of years before definite conclusions in important lines of enquiry are reached. From time to time valuable monographs have been published embodying the results of the work so far as it has progressed. The enquiry concerns the breeding, culture, development, food, habits, diseases and environment of the halibut, herring, shad, haddock, salmon, cod, oyster, lobster, etc. These investigations of course, in addition to their purely scientific interest, are of vast economic importance, the fisheries of Canada aggregating in value \$30,000,000 annually. I draw attention, however, to the work of the Board as an example of the earnest prosecution of important scientific research in Canada; to enter into details illustrative of the problems whose solution is being attempted would involve technicalities foreign to the purposes of this address.

GENERAL SCIENTIFIC RESEARCH

In speaking of the intellectual status and needs of Canada I have endeavoured to distinguish between educational influences affecting the general intelligence of the people and contributions made by literary and scientific men to the non-material assets of mankind; and I have directed attention to the work of the Experimental Farms and of the Biological Board as illustrative of the latter. Research is also pursued with enthusiasm and success by many of the professors in Canadian universities; and their work has won for them distinction and applause in lands beyond their own. But research is engrossing, and flourishes best under an undivided attention; and I know of no Canadian professor whose time is not chiefly taken up with teaching. The Ph.D. degree is supposed to be a reward for original work, for extending the bounds of knowledge; but the candidates

for this degree are in the main immature, and the problems assigned to them are usually isolated and fragmentary. The distinguished President of the Carnegie Institution, Dr. Woodward, speaks of "the elementary notion that research means that modicum of investigation which leads to higher academic degrees;" and elsewhere says "productive research, like any other constructive work, requires arduous, persistent and above all sustained effort under the direction of disciplined experts." The test which regulations for the degree of Ph.D. impose is surely intended rather to determine the individual's capacity for independent thought, his aptitude for entering upon a career of research, or, if he is to become a teaching professor, his capacity for making a given subject his own, so that he will not be, before his classes, merely a servile reproducer of text-books. Such research, therefore, as is undertaken for the doctor's degree must be regarded as a most valuable part of the student's education, and as a new phase of his education; but when we seek for answers to the enquiry how is science to be advanced, we must in general look elsewhere. In our universities we may foster literary production and the progress of science by granting relief from teaching to those professors who have aptitude and inclination for authorship or for scientific research. I have always believed, however, that there is more hope for scientific advancement in the creation of separate institutions devoted to that purpose. In this connection I wish to refer with some detail to two institutions which of recent years have been founded in the United States,—the Carnegie Institution of Washington and the Rockefeller Institute for Medical Research of New York. That they are commonly regarded as the best endowed and most important research institutions in the world is my apology for holding them up as ideals to the Canadian public.

The Carnegie Institution was founded in 1902, and has a present endowment of twenty-two million dollars, yielding an annual interest of five per cent. The object of the institution is "to encourage, in the broadest and most liberal manner, research and discovery and the application of knowledge to the improvement of mankind." It has developed three principal agencies to advance these objects: (1) It has established departments of research within the Institution itself, to attack large problems requiring several investigators, special equipment and continuous effort; (2) It provides means to enable individuals to carry on less important investigations outside the Institution; (3) It publishes the results of the researches coming from the two preceding agencies. It has thus far established eleven of these larger departments of research. I proceed to state what these are, and to refer to some of the problems with which they are occupied:

The Department of Experimental Evolution, situated on Long Island, has been occupied with theories of heredity, the effects of selection, influence of conditions on the germ-plasm, etc.

The Department of Botanical Research, situated at Desert Laboratory, Tucson, Arizona, has been specially engaged in botanical research in desert areas, phyto-chemistry, environic reactions of plants, distribution of desert plants, principles underlying plant successions, reclamation of desert areas, etc.

The Department of Embryology, located at the Johns Hopkins Medical School, Baltimore, has established a remarkable embryological collection, and is studying human embryology.

The Department of Marine Biology, with its principal laboratory at Tortugas, Florida, is pursuing studies on problems of the tropical ocean, paying special attention to those of physiology, oecology, variation, and generally the biology of the West Indian region. Many discoveries in biology and geology have been made.

The Nutrition Laboratory at Boston has been occupied with various problems relating to the important subject of nutrition studies in metabolism, influence on metabolism of various factors as muscular activity, fasting, obesity, therapeutic agents, moderate doses of alcohol, nutritive value of different servings of food.

The Department of Terrestrial Magnetism, with address at Washington, is occupied with a plan for a general magnetic survey of the earth. The famous non-magnetic ship *Carnegie* was constructed for this Department. It is also occupied with researches in atmospheric electricity.

The Geophysical Laboratory at Washington is determining the modes of formation and the physical properties of the rocks of the earth's crust. It is provided with apparatus for the study of materials subject to such high temperatures and high pressures as obtain in the formation of rocks and minerals in the earth's crust.

The Department of Meridian Astrometry has a southern observatory in Argentina engaged in securing accurate measures of the positions of stars visible in the southern hemisphere to be compared with corresponding measurements made at observatories in the northern hemisphere.

The Mount Wilson Solar Observatory at Pasadena, California, is engaged on studies on the sun and on the general problem of stellar evolution. It has associated with it a physical laboratory.

The Department of Economics and Sociology is occupied with economic problems relating to population, immigration, agriculture, forestry, mining, manufacturing, transportation, money, banking, labor movement, etc.

The Department of Historical Research is chiefly engaged in the preparation of publications intended to assist investigators in American history. For this purpose it has explored and catalogued archives in Canada, Cuba, Mexico, England, France, Germany, Spain, Russia, The Netherlands, etc.

The Research Associates subsidized by the Carnegie Institution have a very wide range of activities. In archæology they have explored Mexico and Central America, the shores of the Mediterranean, and Turkestan. They have made contributions to mathematical science. To English and Continental literature they have contributed an edition of the Arthurian Romances in seven quarto volumes. They have made studies in the Polynesian languages.

The Institution has issued about two hundred and fifty publications covering its investigations in science, literature, archæology, economics, and history.

The Rockefeller Institute for Medical Research was founded in 1901 by Mr. John D. Rockefeller. In the aggregate Mr. Rockefeller has contributed twelve million dollars to its endowment. The purposes of the Institute as described by the amended charter are stated as follows: "The object of the Corporation shall be to conduct, assist, and encourage investigations in the sciences and arts of hygiene, medicine and surgery, and allied subjects, in the nature and causes of disease and the methods of its prevention and treatment, and to make knowledge relating to these various subjects available for the protection of the health of the public and the improved treatment of diseases and injury. It shall be within the purposes of the said Corporation to use any means to those ends which from time to time shall seem to it expedient, including research, publication, education, the establishment and maintenance of charitable or benevolent activities, agencies or institutions appropriate thereto, and the aid of any other such activities, agencies or institutions already established or which may hereafter be established."

The Institute, situated in New York, is composed of the Laboratories, the Hospital, and the Department of Animal Pathology. The Laboratories cover the subjects of pathology, bacteriology, chemistry, physiology, pharmacology, experimental biology and experimental surgery. The Hospital is equipped with pathological, physiological, and chemical laboratories of its own. Diseases occurring in domestic animals are of great economic importance, and their investigation is suggestive to the student of human diseases; for this reason the Department of Animal Pathology has been established.

The work in the Hospital at any one time is confined to selected cases that bear on a limited number of subjects chosen for investiga-

tion; and the Director issues from time to time bulletins informing physicians of the diseases chosen for investigation. No charge is made to patients treated at the Hospital. The positions on the staff are supposed to engage the full time of the incumbents. No provision is made for classes or formal instruction, research and not teaching being the purpose of the Institute. Grants are made each year for carrying on investigations at other institutions. The Institute issues monthly two scientific publications, "The Journal of Experimental Medicine" and "The Journal of Biological Chemistry." It also publishes "Studies from the Rockefeller Institute for Medical Research" and "Monographs of the Rockefeller Institute for Medical Research." Possibly the most outstanding researches of the Institute have been the investigation of infant paralysis, the discovery of a curative serum for cerebro-spinal meningitis (Flexner's), and the work by Negouchi on syphilis of the brain and spinal chord.

I have been at pains to set forth with some detail the character of these two institutions as being the best endowed and destined to become, if not so already, the most efficient and productive research institutions in the world. In a sense they are ideals to be imitated elsewhere. A great deal has been said about tainted wealth: it is a question whether these two institutions alone will not give back to the American people full value for all the Carnegie and Rockefeller millions. "If wealth were evenly distributed, and this uniformity were to be maintained, such movements (as these institutions represent) in the line of intensive progress could not be made except through the consent of all to contribute equally thereto: under present conditions practically an impossibility."

That the scientific world approves of institutions exclusively devoted to research is fully attested by the number of such. In medicine there are the Brompton Cancer Hospital, the Lister Institute, and others in England; in the United States there are, in addition to the Rockefeller Institute, the Albany Bender Hygienic Laboratory, the Buffalo Gratwick Laboratory for the Study of Malignant Diseases, the Chicago Memorial Institute for the Study of Infectious Diseases, the Phipps' Institutes of Philadelphia and Baltimore, and the Massachusetts Cancer Research Institute. In physics there are the National Physical Laboratory, the Davy-Faraday Laboratory, etc., in England; in the United States there are, in addition to the Carnegie Institution, the Pittsburgh Mellin Institute, the Washington Bureau of Standards, the Edison Laboratories, the Physical Laboratory of the General Electric Company, the Laboratory of the Western Telegraph and Telephone Company, devoted largely to long-distance telephony, and the Laboratory of the Eastman Kodak Company, devoted to photography, etc.

In the United States so numerous are the institutions devoted entirely to research, so large are the endowments, and so great is the interest in research in the hospitals and in the laboratories connected with the great universities that it is not unlikely the world's centre of gravity of scientific discovery may soon be found in the great Republic.

I have sought in what precedes to form an estimate of the intellectual assets of the Dominion. I have done this, not by a process of literary and scientific criticism and valuation, but by a process of analysis and classification. In these assets I have marked out two great classes. To the first class belong those intellectual forces that affect the education and mental level of the people; to the second belong literary and artistic creation, and scientific discovery and invention. I have been anxious properly to place this second class; to it belongs literary, historical, and scientific research, and within it, in the main, are included the activities of this Royal Society. I have made this analysis and classification as a possible basis, roughly and imperfectly sketched out I confess, of the work of a Bureau which I hope may at no distant day be established in Ottawa. We collect and tabulate at considerable expense statistics respecting crops, production of mines, forests and fisheries, population, births, marriages; and deaths, immigration, etc. Why should we not in like manner in a systematic way and for the whole Dominion, from information supplied by the various provinces, seek to arrive at the non-material assets of Canada, the educational statistics of the provinces, their libraries, museums, and picture galleries, their technical and agricultural schools and colleges, the books that have been published, the researches of whatever kind that have been undertaken and brought to a successful conclusion, the new auxiliary institutions and societies that have come into being and the old ones that have gone out of existence in connection with our universities, the historical, literary, and scientific societies and what they are doing, with whatever else concerns our intellectual advancement. We should have all this published annually in a form convenient of access; we should then know where to go for details.

It is not necessary before such a body as the Royal Society that I should close this address, which already too long has occupied your attention, with the usual trite phrases and accustomed thoughts as to the importance of our physical prosperity and intellectual growth advancing *pari passu*.

APPENDIX B

THE DOMINION ASTRONOMICAL OBSERVATORY



THE DOMINION ASTRONOMICAL OBSERVATORY AND THE BOUNDARY AND GEODETIC SURVEYS

72-INCH REFLECTING TELESCOPE

A statement of progress on this new telescope and its observatory near Victoria, B.C., is given in the Report of Council.

STELLAR SPECTROSCOPY

The past year has been moderately favourable for observing, 694 stellar spectrograms having been obtained as against 906 in the preceding year.

This reduced number is partly due to greater cloudiness and partly to the increased exposure time required for the fainter stars at present under observation. The greater number of these are of spectroscopic binaries whose orbits are under investigation at Ottawa.

The orbits of eight of these binaries have been completed and published. These stars are ζ Andromedae, α Trianguli, μ Persei, 14 Aurigae, Boss 3323, A Boötis, B.A.C. 5890, and 12 Lacertae. The last of these, 12 Lacertae, deserves special mention as having an exceptionally short period, the pair making a complete revolution in 4 hrs. 38 mins., only a few minutes longer than the shortest known, β Cephei.

This makes the total number of spectroscopic binary orbits determined at Ottawa thirty-seven, a creditable record when the size of the telescope is considered, and a greater number than obtained at any other observatory.

STELLAR PHOTOMETRY

The photographic telescope is now well adjusted and has been principally employed in photometric work, the six-inch camera giving good extra-focal images over a field five degrees in diameter. Measures of the opacity of the extra-focal images of the stars are made on the Hartmann Micro photometer. The calibration of the wedge used in this instrument has been carefully carried out by means of sensitometer squares and by measures of plates of the Pleiades, and the corrections for reducing all stars to the centre of the plate have been determined.

As the extra-focal method seemed best adapted to variable star work, the light curves of spectroscopic binaries, especially of those whose orbits have been determined here, are being investigated. The programme includes 50 Draconis, σ Geminorum, θ^2 Tauri, b Persei, 18 Aquilae, δ Librae and 12 Lacertae. The last shows strong evidence of light variation and will be closely followed; 50 Draconis also shows signs of variability. δ Librae is being observed to improve the present light curve. Work on the others has not been carried sufficiently far to warrant any statement.

SOLAR INVESTIGATIONS

Direct photographs of the sun, 35 in number were obtained on suitable days when spots were present, but this work was stopped for some time to permit of repairs to the shutter. With the coelostat telescope and solar spectrograph 330 plates were obtained. These include series, taken at several different wave-lengths, of spectra of centre and limb simultaneously and in some cases with a comparison spectrum of iodine absorption added. A number of plates of sun spot spectra were also made.

The plates for the determination of the solar rotation made in 1911, 1912 and 1913 were finally reduced and discussed and the summarized results published in the *Astrophysical Journal*. They are now being prepared for final publication in the *Dominion Observatory Publications*. The results of all these years are in close agreement, although there seems to be slight evidence of decreased values in 1913, but not more than can be explained by change in habit of measurement.

A special series of plates around the equator in the region near the D group, where atmospheric absorption lines enabled instrumental errors to be eliminated, gave strong evidence of a short period variation in the solar rotation, and the lower value in 1915 than in 1913 showed also possibility of a secular change in the rate. Two other interesting researches on "Measurements of Blended Spectra" and on "The Psychology of Differential Measurements," bearing on the results obtained in the measurement of solar spectra, have recently been published in the *Journal of the Royal Astronomical Society of Canada*.

MERIDIAN OBSERVATIONS

Observations with the meridian circle were obtained on 121 nights; there were about 2,700 observations for right ascension and 1,600 for declination; the work with this instrument was devoted mainly to the list of latitude stars which has been under observation for several years.

The time service has been maintained as in previous years; this includes, on the one hand, the operation of the electrical clocks in the Government buildings, the maintenance of relays beating seconds in several offices in the city, and the sending out of time signals by telegraph and telephone; on the other the various incidental requirements of the Observatory, such as operation of chronographs, recording of time on the seismographs, rating of watches and chronometers, etc. The dropping of the time-ball has been discontinued for the present, since the fire in the Parliament building.

The astronomical field work consisted of the determination of latitude and longitude at thirteen points. Of these one was a Laplacian point, to be used in the adjustment of a portion of the geodetic net; at this station, which was in eastern Quebec, the azimuth of one of the lines of the triangulation was also measured. The establishment of such Laplacian points, involving determination at the same point of longitude, latitude, and azimuth will be required at various stations as a means of eliminating certain cumulative errors in the geodetic triangulation.

Of the remaining stations the longitudes of three northern, Ontario, along the National Transcontinental railway, were determined by electric telegraph from Ottawa. The remaining nine, seven in Québec and two in Ontario, near Georgian bay, were determined by wireless telegraphy in the manner described in last year's report. The latitudes of all these stations were also determined.

GEOPHYSICS

During the past year the instruments for the study of the deformation of the earth under the influence of the moon and sun, an international undertaking, have been set up in the specially constructed vault, and continuous photographic records have been obtained.

The seismographic instruments have been in constant operation during the year and 81 earthquakes were recorded. Seismological tables were issued and distributed amongst practically all the seismological stations of the world. As these are the first complete tables issued they will tend towards uniformity in interpretation of seismograms. The monthly bulletins of recorded earthquakes have been continued as heretofore. The undagraph at Chebucto, near Halifax, has been in operation during the year and recorded the waves of the Atlantic reaching Chebucto, for correlation with the micro-seismic record at the Observatory.

The magnetic survey of Canada has progressed satisfactorily. During the season 48 new stations were occupied, at each of which the three magnetic elements, declination, inclination, and intensity

were observed. The most of the stations were in British Columbia, including a series along the Grand Trunk Pacific railway from Prince Rupert eastward. There is a growing public demand for the results of this survey, especially in regard to the declination or variation of the compass, as popularly called.

The gravity survey completed a good season's work by occupying 24 stations across the continent, besides Ottawa the base station, which in turn is linked up by inter-comparison with Washington, thereby making the Canadian observation of international standard. The observations have all been made with the Mendenhall half-seconds pendulum, whereby an accuracy within the one-tenmillionth of a second of time for the period of the pendulum is attained.

SURVEYS

The first draft of the report on the survey of the 141st meridian between Yukon territory and Alaska, has been approved by the Commissioners, and thirty-two of the thirty-eight map sheets have been printed and the proofs of the remaining six have been examined.

The maps of the boundary between British Columbia and south-eastern Alaska are being made ready for the printers.

On the Ontario-Minnesota boundary, the survey is completed from the Northwest Angle, Lake of the Woods, to the outlet of Namakan river from Lake Lacroix. It will require a short season's work to make connection at Curtain Falls with the survey from Lake Superior. This will complete the Canadian sections of this boundary.

The Quebec-Maine boundary along the highlands was completed from the head of the south west branch of the St. John river, to where the line passes between Portage Lake in Quebec and Penobscot lake in Maine.

A triangulation was also carried from Lake Pohenagamook at the head of the St. Francis river, to a point on the St. John river, about ten miles from the north and south line, between New Brunswick and Maine, a distance of 96 miles.

On the Geodetic Survey of Canada a reconnaissance was made from the vicinity of Hecate strait to Queen Charlotte sound, including Queen Charlotte islands and the islands adjacent to the mainland. Angle measures were made at five primary stations with a 12-inch theodolite. Oldfield station in the vicinity of Prince Rupert was prepared as a Laplace Station.

The triangulation west from Lake Superior is completed to Sagahinage lake, and the reconnaissance extended to the middle

of Basswood lake where a base has been measured by the U. S. Surveyors. It is the intention to establish a Laplace station by wireless telegraph in the neighbourhood of this base.

THE TRIANGULATION, ETC.

During the season of 1915, three field parties were engaged in extending primary triangulation in connection with the Geodetic Survey of Canada; one party was employed observing horizontal directions in the London district with a 12-inch altazimuth instrument reading to one second of arc. Another party measured two base lines, one in the vicinity of Collingwood and the other a short distance west of London, Ontario, both of which are connected with the primary triangulation by base nets. A third party conducted a reconnaissance survey across the State of Maine, having for its object a direct connection between the Canadian primary triangulation in the southeastern part of the province of Quebec with the primary triangulation in the southwestern portion of the province of New Brunswick.

All of the work of the season of 1915 was most satisfactory. A number of triangles were closed with an average closing error of considerably less than one second of arc. It was also noted that the closure of the circle—when observing horizontal directions—averaged less than one-quarter of a second.

Precise levelling was carried on during the season of 1915 by six parties, one of which operated in New Brunswick and Quebec, two in Ontario, one in Alberta, one in British Columbia, and one in Alberta and British Columbia. Over 1,800 miles of levelling was accomplished during the season and the net of precise levels considerable strengthened by the closure of several additional circuits.

A transcontinental line of levels—extending from Halifax to Vancouver—has now been almost completed; only two unlevelled sections, of less than 300 miles each, now remaining to complete such a line. It is proposed during the coming season to make a vigorous effort to accomplish these connections.

Requests for the elevations resulting from precise levelling have been received in considerable number from engineering and surveying organizations and the number of such inquiries is constantly becoming greater as the work becomes more widely known to the public.



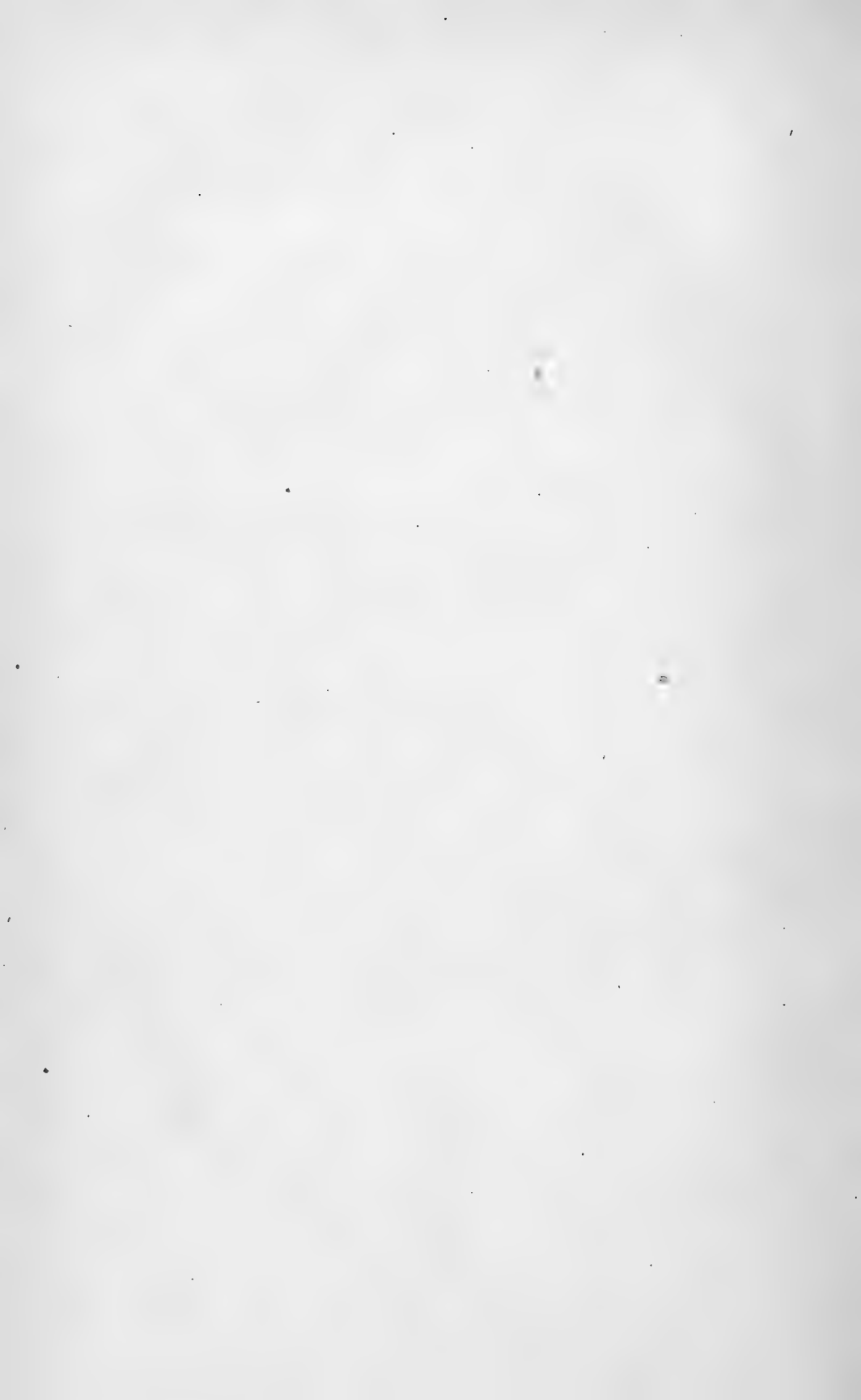
APPENDIX C

THE METEOROLOGICAL SERVICE OF CANADA

BY

SIR ROBERT F. STUPART, Kt., F.R.S.C.

Director, Dominion Meteorological Service



REPORT OF THE METEOROLOGICAL SERVICE

Meteorological records from 684 stations have been received, and the results have been used in the preparation of the various regular publications of the Service, including the "Annual Climatological Report," the "Monthly Weather Review" and the "Monthly Weather Map." In addition to these regular publications the Service has issued a booklet on the "Temperature and Precipitation of British Columbia" which gives in detail the climatic factors of that province. Similar booklets for the other provinces are to follow, and the whole will subsequently be bound together. Also has been issued a small brochure on the "Climate of Canada."

There is an ever-increasing demand by pulp and water power companies for information regarding the rainfall over the water sheds of rivers and it is obvious that the Service must greatly increase the number of rain gauge observers.

The usual activities of the Service in connexion with the issue of weather forecasts and storm warnings have been carried on without break, with the result that 85.6 per cent of the daily forecasts have been verified and 87.4 per cent of the warnings.

PHYSICS BRANCH

Upper Air: Throughout 1915 the international balloon work was completely disorganised but for 1916 as many of the nations are continuing the work during the war, a list of international days has been arranged and is being followed in Canada. In 1915 one balloon a month was sent up except in June when three were dispatched, the dates corresponding with those selected in Britain.

The recoveries during the year were not good, and only eleven out of sixteen have been found up to the present. Previous to 1915 all meteorographs recovered had usable records, but during the year two of those recovered had no records on them and another was spoiled. The following table gives the particulars of the ascents.

Date	Greatest Height	Temp. at Greatest Height	Height of Stratosphere	Temp. at base of Stratosphere	Remarks
1915					
April 10.....	11.3 Mls.	-70°F.	7.3 Mls.	-73°F	
June 2nd.....	6.6 Mls.	-62°F.	Not reached		(Found in Lake Huron)
June 3rd.....	7.3 Mls.	-68°F.	Not reached		(Found in Lake Erie)
Nov. 11th.....	9.6 Mls.	-82°F.	7.5 Mls.	-88°F.	
1916					
Feb. 29th.....	7.6 Mls.	-54°F.	5.9 Mls.	-72°F.	

The ascent of June 2nd is very interesting as showing the height to which the southeasterly current extended; it is the third occasion on which a balloon was found west of the starting point.

The results of all the ascents up to May, 1915, have been worked out in ordinary and absolute units according to the request of the International Meteorological Committee, and published in a paper on Upper Air Investigation in Canada, Part I, M.S. 51.

Part 2 of the investigation will contain an account of the kite work and is now in the press. A number of records of the pilot balloons sent up in the Arctic have been received and from those worked out it is anticipated very valuable information will be obtained in regard to the Air Currents in the Arctic zone.

Radiation: The comparison of the Angstrom Pyrheliometer with the Callendar Sunshine Receiver has been completed, and the results obtained suggest the possibility of designing a new form of sunshine receiver that will eliminate some of the defects of the present form.

The Callendar Sunshine Receiver has been in operation throughout the year, and whenever opportunity occurred the measurement of the amount of heat received on a surface exposed perpendicularly to the sun's rays have been measured by the Angstrom Pyrheliometer.

The results to date for both instruments have been reduced, and the mean is given in the following table for each month.

Instrument	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Callendar-Gram. Calories per day on a horizontal surface of 1 sq. cm.....	90	203	270	280	401	446	389	339	261	198	107	83	
Angstrom-Gram. Calories per min. per sq. cm.....	1.185	1.209	1.239	1.293	1.180	1.216	1.079	1.119	1.221	1.110	1.188	1.091	1.167

Anemometer Comparison: The anemometer in use at Canadian stations has never been compared with those in use in other countries; it is designed on the assumption that the distance travelled by the wind is three times the distance travelled by the centre of the anemometer cups in the same time. This factor has been found to be too high in other countries, and for the standard anemometer at Kew, the factor 2.2 instead of 3 has been found to be correct. The Dines pressure tube anemometer has been very carefully compared on a whirling machine and with the Kew standard; for this reason a pressure tube anemometer was erected on the same tower as the Canadian cup anemometer four years ago, and the records given by the two instruments have been compared. The mean of all velocities gives the cup anemometer readings higher than those of the Pressure Tube but the factor is variable and intermediate between 2.2 and 3.

Electric Potential of the Air: The self recording electrometer for measuring the potential of the air has been in operation throughout the year, and the results to date will be published shortly.

Evaporation: Observations on evaporation have been made at the Central Office for some years, and during the past two years the observations have been continued during the winter by weighing a pan of water or ice, and from the loss in weight from day to day, the amount of evaporation has been calculated. Owing to the increasing requests for evaporation data, it is proposed to extend the observations this year and establish evaporation stations at about seven places in the Dominion.

Earth Temperature: Mr. Patterson has designed a special commutator for use with resistance thermometers by means of which it will be possible to get continuous records of earth temperatures at various depths on one instrument, and it is hoped to get it installed during the year.

Barograph and Thermograph: The barograph and thermograph obtained for recording the pressure and temperature on the top of Sulphur Mountain at Banff has been overhauled in the office, and they will now work for about a month without requiring attention. Mr. Patterson has substituted a mercurial barometer for the aneroid on the barograph and by means of a float arranged to compensate for temperature changes, he has converted the barograph into a compensated mercurial barograph recording at a distant station.

AGRICULTURAL METEOROLOGY

At the General Assembly of the International Institute of Agriculture held in Rome in May, 1913, it was unanimously resolved that the subject of Agricultural Meteorology, should become a recognised

study, and a committee composed of Meteorologists and Agriculturists was appointed to outline a general International plan of action. This Committee had not met, however, prior to the outbreak of the war, and it is now nearly certain that it will not meet for some years. In Canada, however, some progress has been made along the lines which would probably have been suggested by the Committee had it met.

Early in 1914, Mr. R. W. Mills, B. Agr., was appointed to take charge of Agricultural Meteorology, in connexion with the Meteorological Service, and most satisfactory work has been done, adopting tentatively the Russian Bureau of Agricultural Meteorology as a model.

The Service in Russia was organised in 1897. Its characteristic feature is a system of Agricultural Meteorological stations throughout the empire, which in addition to being equipped with the necessary Meteorological instruments, are provided with experimental plots on which various crops are grown for the purpose of definitely studying the effect of the Meteorological and climatological conditions on plant growth.

In Canada with the approval of the Director of the Dominion Experimental Farms and the hearty co-operation of Dr. F. Shutt, work was inaugurated by the carrying on of a field experiment on spring wheat in relation to the weather, or Meteorological environment.

A plot of Marquis variety was grown at each of fourteen stations, distributed throughout Canada from the east to the west coast. At every station regular daily records were, and indeed have been for a varying number of years, taken of precipitation, maximum and minimum temperatures, and bright sunshine.

Observers recorded crop notes on a printed form, adapted from a model translated from Russian. Questions called for a good deal of information, including (1) General field conditions and the farming methods employed, (2) Dates of the important stages in the life of the wheat, from sowing to reaping, and the general condition of the plants at the time of these stages, (3) Average height of the plants on the plot every seven days, (4) The damaging effect of adverse weather phenomena on plants and soil at any time throughout the season, and losses due to Meteorological and to other factors, and (5) Final yield and quality. After threshing time, the completed forms were returned to the Central Office of the Meteorological Service, where the weather and crop data were correlated.

But before an attempt at such correlation was made, every experimental station engaged in the co-operative work was visited and a knowledge of conditions, climatic and agricultural, obtained at first hand.

During the winter of 1915-16 all possible data were recorded by a graphical method, and by tables; correlations of wheat and weather were studied, and cautious conclusions will be drawn.

By a co-operative agreement with the office of experiment stations of the United States,* the translation of many of the most valuable Russian publications has proceeded simultaneously at Washington and at Toronto. Copies of all translations were exchanged. Also, Dr. T. K. Doherty, Canadian Commissioner of the International Institute of Agriculture has translated from the French several articles by Prof. P. Broounoff, Chief of the Russian Bureau of Agricultural Meteorology. Through the kindness of Dr. Doherty these articles, together with the best of those in Russian, will likely become available to Canadians in the Bulletin of Foreign Agricultural Intelligence published by the Dominion Department of Agriculture; and these translated articles should serve to educate, and to awaken public interest.

It is proposed in 1916 to continue the experimental work of 1915. Acknowledgment is due in Canada to Dr. Shutt and to Dr. C. E. Saunders, Dominion Cerealists, for their courteous assistance in the development of the field experiments. Mr. Mills is to spend the whole of the growing season of 1916, at the Central Experimental Farm at Ottawa, in order to be in closest contact with the agriculture and biology of the subject.

TERRESTRIAL MAGNETISM

The photographic magnetic instruments have been kept in operation without any material loss of record. The value of the base line for Declination was determined from weekly observations with the absolute Declinometer. The observations were usually made on Monday and comprise four sets of eight pointings on the magnet taken in conjunction with eye readings of the photographic instrument. For Horizontal Force the base line was determined twice a month as before. In the case of the Vertical Force, it was found necessary to increase the number of absolute observations to four per week in order to reduce the probable error to $\pm 2\gamma$.

The westerly Declination has increased from $6^{\circ} 27'.2$ in March, 1915, to $6^{\circ} 32'.2$ in March, 1916, and annual change of $5'.0$. The Horizontal Force has decreased during the same period from 0.16039 dynes to 0.15983 , an annual change of 0.00056 dynes, whilst the Vertical Force has decreased from 0.58673 dynes to 0.58553 . This change in Horizontal and Vertical Force is equivalent to a change in the Inclination from $74^{\circ} 42'.7$ to $74^{\circ} 43'.9$.

Magnetic disturbances were of very frequent occurrence during the year, the month of February, 1916, being the only month during which no large disturbance was recorded. The greatest storm was on June 17th, which was remarkable both for its duration, the magnitude of the disturbing forces, and the rapidity with which the forces changed. The extreme values of Declination during this storm were $5^{\circ} 6' \cdot 2$ west and $8^{\circ} 21' \cdot 7$ west. The Horizontal Force ranged from 0.15586 dynes to 0.16418 dynes and the Vertical Force from 0.58040 dynes to 0.59152 dynes.

Other disturbances worthy of note were recorded on August 25, October 15, and November 5 and 6, of 1915, and on March 17, 1916, but neither in amplitude nor duration are any of these comparable to that of June 17, 1915.

The mean diurnal range obtained from the hourly measures varied in Declination from a maximum of $14' \cdot 4$ in August, 1915, to a minimum of $6' \cdot 5$ in December, 1915, in Horizontal Force from a maximum of 0.00052 dynes in August to a minimum of 0.00028 dynes in December, and in Vertical Force from a maximum of 0.00032 dynes in November, 1915, to a minimum of 0.00006 dynes in December, 1915, and February, 1916.

In November at the request of Dr. L. A. Bauer, Director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, Mr. Jackson of the Observatory staff was sent to Washington in order to make a series of comparisons between the Agincourt Magnetic instruments and the International Magnetic Standard as determined by Dr. Bauer.

The results of these comparisons are as follows:

I.M.S.—Agincourt (Standard Declinometer) = $-0' \cdot 93$

I.M.S.—Agincourt (Elliott Magnetometer 98) = $-0 \cdot 00033H$

I.M.S.—Agincourt (Toepfer Inductor No. 89) = $-0' \cdot 15$

Commencing January, 1916, all Agincourt data will be reduced to International Magnetic Standard.

During the year 129 compasses attached to Surveyors' transits, were adjusted and compared with the Agincourt Standard Declinometer, and the index corrections resulting therefrom were supplied to the Surveyor General. Assistance was given to Messrs. Purser, Wight, and Robinson of the Department of the Interior in standardising their total force Magnetic Instruments both before and after their field work.

Mr. French of the Dominion Observatory was also given assistance in comparing his magnetometer with the Agincourt Standards both before and after his field work.

SEISMOLOGY

The Milne Seismographs at Toronto and Victoria have yielded some very interesting records. A Seismograph for registering the vertical component, recording on smoked paper has recently been installed at Victoria, and is working very satisfactorily. During the year the total number of disturbances recorded at Toronto was 123 and at Victoria 129. Of this number, three were very large. Fourteen were of a more moderate character, and the remainder show trace amplitudes ranging from 0.1 to 2 mm. Not only was the total number greater than that which we usually record, but from May 1st there was a marked increase in the intensity of the disturbances. The most important of the series occurred on September 7th, October 3rd, and January 1st. The latter disturbance was one of the largest we ever recorded at Toronto. The earthquake centres were located respectively in Guatemala, Nevada, and in the South Pacific, the latter being submarine; possibly in the vicinity of the New Hebrides. The more moderate disturbances were recorded on May 1st; June 1st; July 31st; October 11th; November 1st, 21st; December 12th, 31st; January 13th, 19th; February 1st, 6th, 20th, and 27th. The majority were of submarine origin, the earthquake centre being in the vicinity of the Kurile Islands, Alaska, and off the coast of Central America.

PHENOLOGICAL OBSERVATIONS, CANADA, 1915

Mr. F. F. Payne of the Central Office of the Meteorological Service makes the following report on the Phenological Observations of 1915:—

"Of the phenological reports received five were from British Columbia, four from Alberta, nine from Saskatchewan, six from Manitoba, six from Ontario, two from Quebec, and two from New Brunswick. The total number from these provinces shows a marked falling off in the interest displayed in past years, and this can only be accounted for by the distraction of the war. The averages for Nova Scotia are excellent as usual and are full of interest. In British Columbia vegetation was unusually forward in the spring, and these conditions, though less marked, were continued until the ripening of grain crops. In Alberta, Saskatchewan and Manitoba, the spring conditions were similar to conditions in British Columbia, but somewhat later in the summer vegetation was retarded and the date of ripening of grain crops was later than in 1914. In Ontario, spring vegetation was generally earlier than the average, and although this was not so marked the ripening of grain was earlier than in 1914. In

the province of Quebec, vegetation in the spring was somewhat more forward than in 1914. In New Brunswick the early spring vegetation was unusually forward, but somewhat later growth was much slower and quickly reached normal conditions. In Nova Scotia, growth in plant life was generally more forward than usual from early spring to the date of ripening of grain.

"The average dates for Nova Scotia given in a separate table were supplied by Dr. A. H. Mackay, Superintendent of Education, for that Province, to whom, and also to his assistants, the Meteorological Service is much indebted. These averages are computed from a very large number of schedules supplied by the teachers throughout the Province assisted by their pupils who make this part of their study of nature.

"The Province of Nova Scotia is divided into its main climatic slopes or regions which are not in some cases co-terminous with the boundaries of the counties. Slopes, especially those to the coast, are subdivided into (a) coast belts, (b) low inland belts, and (c) high inland belts. Where these letters appear in the tables they refer to these slopes or regions. Dates for Slopes IX and X were combined in computing the average for the Province but for convenience are duplicated and entered under each of these slopes in the tables. The following regions are marked out, proceeding from south to north and from east to west as orderly as it is possible."

Region of Slopes	Belts	
I. Yarmouth and Digby Counties.....	(a) Coast,	(b) Low in-
	lands,	(c) High in-
		lands.
II. Shelburne Queens & Lunen'g Co's...		
III. Annapolis and Kings Counties.....	(a) Coast,	(b) North Mts.
	(c) Annapolis Valley	
	(d) Cornwallis Valley,	
	(e) South Mts.	
IV. Hants and Colchester Counties.....	(a) Coast,	(b) Low In-
	lands,	(c) High Inlands.
V. Halifax and Guysboro Counties.....	"	"
VI. Cobequid Slope (to the south).....	"	"
Chignecto Slope (to the northwest)...	"	"
VII. North'rland Sts. Slope (to the north)	"	"
VIII. Richmond and Cape Breton Co's....	"	"
IX. Bras d'Or Slope (to the southeast)...	"	"
X. Inverness Slope (to Gulf, northwest).	"	"

Owing to the great number of observers and others taking part in the production of the tables for Nova Scotia their names are omitted in the following list.

LIST OF STATIONS AND OBSERVERS

S. R. (S. Bayne, Alberni, B.C.
W. H. Quant, Keremeos, B.C.
Mrs. Hugh Hunter, Princeton, B.C.
John Strand, Quesnel, B.C.
C. F. Walker, Tzouhalem, B.C.
Robert Jones, Fort Vermilion, Alta.
Mrs. W. L. Fulton, Halkirk, Alta.
Thomas B. Waite, Ranfurly, Alta.
L. B. Potter, Eastend, Sask.
R. H. Carter, Fort Qu'Appelle, Sask.
Miss M. E. Brown, Rabbit Lake, Sask.
C. W. Bryden, Mistawasis, Sask.
George Lang, Indian Head, Sask.
A. C. McKenzie and pupils, Landis, Sask.
H. F. Perkins, Prince Albert, Sask.
Victor Willing, Saskatoon, Sask.
Mrs. Helena Graham and pupils, Wanganui, Sask.
William Irvine, Almasippi, Man.
G. H. Blackwell and pupils, Dickens, Man.
C. J. Baragar, Elm Creek, Man.
Miss Mary Dutton, Gilbert Plains, Man.
Alfred Goodridge, Oak Bank, Man.
James D. Plaice, Rapid City, Man.
Norman Criddle, Treesbank, Man.
John Hollingsworth, Beatrice, Man.
Miss Mary Moffit, Cape Croker, Ont.
W. E. McDonald, Lucknow, Ont.
L. G. Morgan, Port Dover, Ont.
M. A. Thompson, Queensboro, Ont.
F. F. Payne, Toronto, Ont.
David McKenzie, Abitibi, Que.
A. C. Gorham, Macdonald College, Que.
Miss Mable McKinney, Benton, N.B.
Miss Mildred M. Kitchen, Lower Woodstock, N.B.

[illegible]

[illegible]

143	139	140	143	157	152	140	152	158	25	Buttercup (<i>Ranunculus acris</i>).....	"	147	160	156	148	165	166
130	124		153	149	161		159	162	26	Yellow Pond Lily (<i>Nuphar advena</i>).....	"		158	158		183	166
97	73	104	211	206	207	251	100	87	27	Blue-eyed Grass (<i>Sisyrinchium</i>).....	"	166	157	164			
102	97	104	72	76	96	106	98	103	28	Saskatoon (<i>Amelanchier Canadensis</i>).....	"	221	121	227	263		
98	94	110	73	110	81	113	91	97	29	Golden Rod (<i>Solidago</i>).....	"		216				
			74	95	104				30	Wild Geese.....							
			74	80	83	101	155	144	31	Wild Ducks.....			84	110		130	
			76	96	105	112		141	32	Robins (<i>Merula</i>).....			95	97	107	140	
			92	110	94	91	100	103	33	Meadow Larks (<i>Sturnella</i>).....							
136	117	123	134	102	108	141	110	134	34	Blue Birds (<i>Sialia sialis</i>).....			84	91		151	
			161	126	131	140	108	104	35	Flickers or Golden Woodpeckers (<i>Colaptes auratus</i>).....			97	110		148	
136	134		159	139	131	140	126	104	36	Song Sparrows (<i>Melospiza fasciata</i>).....			94	100	108	110	
143	137	131	127	159	139	122	141	125	37	Swallows (<i>Hirundo riparia</i>).....			107	115	145	116	
			140	135	130	129	155	149	38	Juncos (<i>Junco hyemalis</i>).....			106	106	123	110	
95	103	104	97	97	104	119	105	109	39	Orioles (<i>Icterus garrulus</i>).....			126	140	148	148	
			111	106	98	149	115	96	40	King Birds (<i>Tyrannus tyrannus</i>).....			139	141	151	137	
			89	94	87	121			41	Humming Birds (<i>Trochilus colubris</i>).....			144	141	162	161	
			94	77	69	116	92	90	42	Frogs Piping.....			97	106	125	127	
			100	102	105	102	97	111	43	Earth Worm Casts (frost out of ground).....			110	100	109		
100	96	110	110	114	105	111	121	113	44	Lakes Open.....							
210	95	118	181	167	176	186	181	195	45	Rivers Open.....			106	105	131	110	
223	218	240	214	207	198	201	205		46	Ploughing.....			121	112	145	127	
131			139	114	117		125	126	47	Sowing.....			189	197	215		
									48	Hay Cutting.....			230	213			
									49	Grain Cutting.....			155	145	145	141	145
									50	Potato Planting.....			148				

IV. PHENOLOGICAL OBSERVATIONS, CANADA, 1915

When first seen			When becoming common		
YEAR 1915					
Day of the year corresponding to the last day of each month					
January.....	31	July.....	212		
February.....	59	August.....	243		
March.....	90	September.....	273		
April.....	120	October.....	304		
May.....	151	November.....	334		
June.....	181	December.....	365		
Average Dates			Average Dates		
I. Yarmouth and Digby Counties, N.S.	111	104	I. Yarmouth and Digby Counties, N.S.	111	104
II. Shelburne, Queens, and Lunenburg Counties, N.S.	129	117	II. Shelburne, Queens, and Lunenburg Counties, N.S.	129	117
III. Annapolis and Kings Counties, N.S.	113	100	III. Annapolis and Kings Counties, N.S.	113	100
IV. Hants and Colchester Counties, N.S.	120	127	IV. Hants and Colchester Counties, N.S.	120	127
V. Halifax and Guysboro Counties, N.S.	136	128	V. Halifax and Guysboro Counties, N.S.	136	128
VI. Cobequid and Chignecto Slopes, N.S.	137	131	VI. Cobequid and Chignecto Slopes, N.S.	137	131
VII. Northumberland Slope, N.S.	134	128	VII. Northumberland Slope, N.S.	134	128
VIII. Richmond and Cape Breton, N.S.	133	133	VIII. Richmond and Cape Breton, N.S.	133	133
IX. Bras d'Or Slope, N.S.	127	127	IX. Bras d'Or Slope, N.S.	127	127
X. Inverness Slope, N.S.	138	136	X. Inverness Slope, N.S.	138	136
1. Alder (<i>Alnus incana</i> , Wild).....	108	108	1. Alder (<i>Alnus incana</i> , Wild).....	108	108
2. Aspen (<i>Populus tremuloides</i>).....	116	131	2. Aspen (<i>Populus tremuloides</i>).....	116	131
3. May Flower (<i>Epigaea repens</i> , L.).....	115	113	3. May Flower (<i>Epigaea repens</i> , L.).....	115	113
4. Field Horsetail (<i>Equisetum arvense</i>).....	125	129	4. Field Horsetail (<i>Equisetum arvense</i>).....	125	129
5. Blood Root (<i>Sanguinaria Canadensis</i>).....	132	137	5. Blood Root (<i>Sanguinaria Canadensis</i>).....	132	137
6. White Violet (<i>Viola Blanda</i>).....	130	130	6. White Violet (<i>Viola Blanda</i>).....	130	130
7. Blue Violet (<i>Viola palmaria</i> , <i>calceolata</i>).....	133	133	7. Blue Violet (<i>Viola palmaria</i> , <i>calceolata</i>).....	133	133
8. Hepatica (<i>Hepatica triloba</i> , etc.).....	127	127	8. Hepatica (<i>Hepatica triloba</i> , etc.).....	127	127
9. Red Maple (<i>Acer rubrum</i>).....	136	137	9. Red Maple (<i>Acer rubrum</i>).....	136	137
10. Strawberry (<i>Fragaria Virginiana</i>).....	131	134	10. Strawberry (<i>Fragaria Virginiana</i>).....	131	134
11. Strawberry (<i>Fragaria Virginiana</i>).....	170	170	11. Strawberry (<i>Fragaria Virginiana</i>).....	170	170
12. Dandelion (<i>Taraxacum officinale</i>).....	133	133	12. Dandelion (<i>Taraxacum officinale</i>).....	133	133
13. Adder's Tongue (<i>Opuntia trifolia</i>).....	140	140	13. Adder's Tongue (<i>Opuntia trifolia</i>).....	140	140
14. Gold Thread (<i>Copitis trifolia</i>).....	137	140	14. Gold Thread (<i>Copitis trifolia</i>).....	137	140
15. Spring Beauty (<i>Claytonia Caroliniana</i>).....	132	132	15. Spring Beauty (<i>Claytonia Caroliniana</i>).....	132	132
16. Ground Ivy (<i>Nepeta Glechoma</i>).....	143	143	16. Ground Ivy (<i>Nepeta Glechoma</i>).....	143	143
17. Indian Pear (<i>Amelanchier Canadensis</i>).....	148	148	17. Indian Pear (<i>Amelanchier Canadensis</i>).....	148	148
18. Wild Red Cherry (<i>Prunus Pennsylvanica</i>).....	151	151	18. Wild Red Cherry (<i>Prunus Pennsylvanica</i>).....	151	151
19. Blackberry (<i>Vaccinium Can. and Penn.</i>).....	155	155	19. Blackberry (<i>Vaccinium Can. and Penn.</i>).....	155	155
20. Blackberry (<i>Vaccinium Can. and Penn.</i>).....	212	212	20. Blackberry (<i>Vaccinium Can. and Penn.</i>).....	212	212
21. Blueberry (<i>Vaccinium Can. and Penn.</i>).....	162	162	21. Blueberry (<i>Vaccinium Can. and Penn.</i>).....	162	162
22. Tall Buttercup (<i>Ranunculus acris</i>).....	155	155	22. Tall Buttercup (<i>Ranunculus acris</i>).....	155	155
23. Creeping Buttercup (<i>R. Repens</i>).....	160	160	23. Creeping Buttercup (<i>R. Repens</i>).....	160	160
24. Painted Trillium (<i>Trill. erythrocarpum</i>).....	162	162	24. Painted Trillium (<i>Trill. erythrocarpum</i>).....	162	162
25. Painted Trillium (<i>Trill. erythrocarpum</i>).....	168	168	25. Painted Trillium (<i>Trill. erythrocarpum</i>).....	168	168

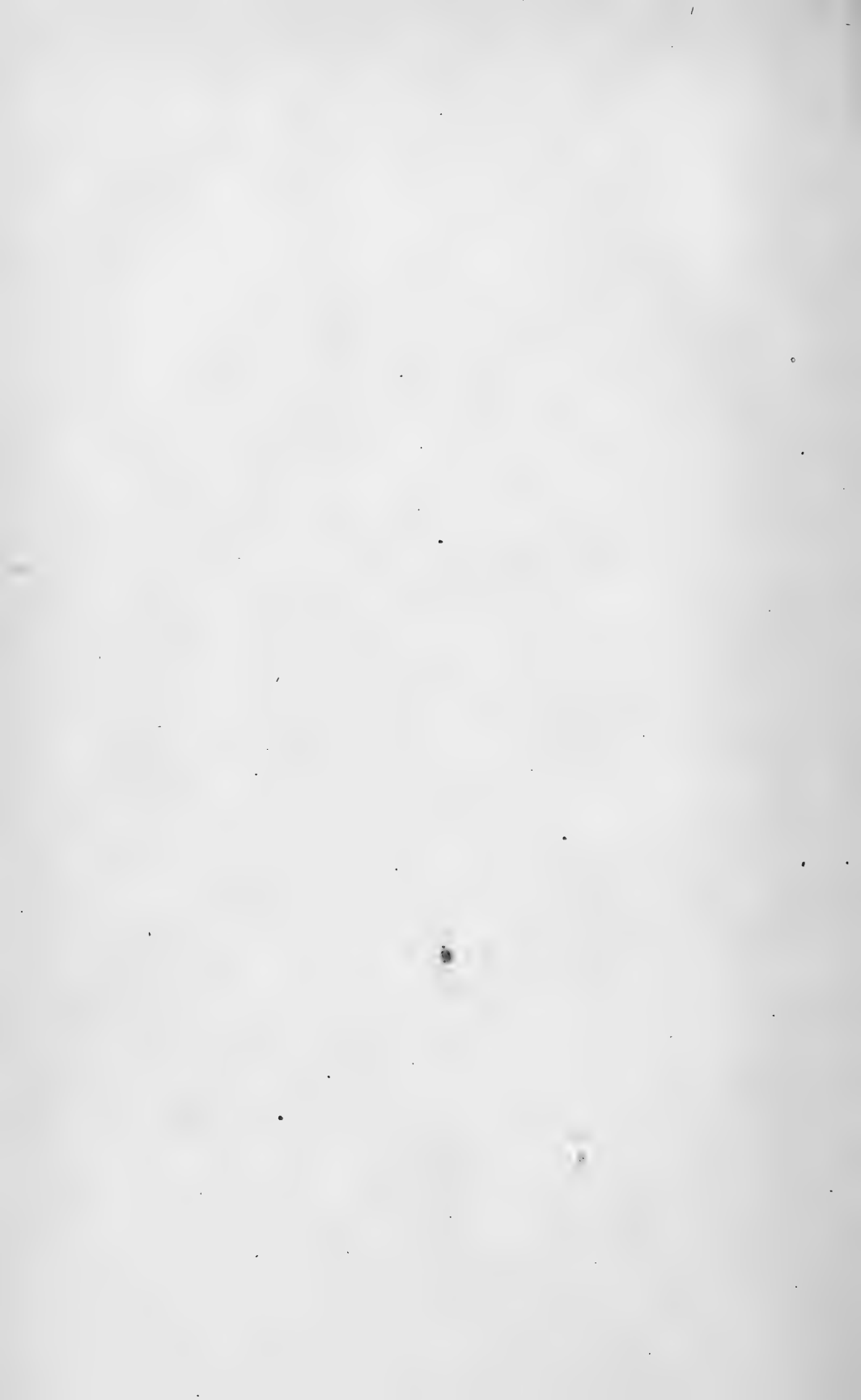
148	147	146	145	144	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
148	147	146	145	144	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
148	147	146	145	144	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
148	147	146	145	144	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35</																																		

THE ROYAL SOCIETY OF CANADA

V. PHENOLOGICAL OBSERVATIONS, CANADA, 1915

When first seen			YEAR 1915		When becoming common									

359	271	291	137	264	76b. Water in streams—low.....	
263	239	269	293	269	77a. First autumn frost—hoar.....	
304	315	268	321	321	77b. First autumn frost—hard.....	
261	285	298	309	305	78a. First snow to fly in air.....	
315	322	300	321	323	78b. First snow to whiten ground.....	
336	363	311	345	345	79a. Closing of lakes.....	
365	338	338	349	355	79b. Closing of rivers.....	
84	93	85	87	92	81a. Wild ducks migrating, N.....	
284	328	100	79	264	81b. Wild ducks migrating, S.....	
84	90	92	88	99	82a. Wild geese migrating, N.....	
326	350	290	284	289	82b. Wild geese migrating, S.....	North
78	78	88	87	88	83. Melospiza fasciata.....	"
88	84	90	89	101	84. Turdus migratorius.....	"
131	122	85	132	134	85. Junco hiemalis.....	"
117	121	112	119	128	86. Actitis macularia.....	"
118	117	129	106	128	87. Sturnella magna.....	"
137	136	138	133	147	88. Ceryle alcyon.....	"
134	134	141	145	142	89. Dendroica coronata.....	"
95	131	138	120	127	90. D. aestiva.....	"
147	145	145	154	153	91. Zonotrichia alba.....	"
136	140	136	143	141	92. Trochilus colubris.....	"
131	137	120	145	141	93. Tyrannus Carolinensis.....	"
144	129	145	142	143	94. Dolichonyx oryzivorus.....	"
97	153	153	159	142	95. Spizis tristis.....	"
151	151	153	142	142	96. Setophaga ruticilla.....	"
112	125	130	148	137	97. Ampelis cedrorum.....	"
104	98	106	102	114	98. Chordeiles Virginianus.....	"
106	103	120	122	126	99. First piping of frogs.....	"
			106	123	100. First appearance of snakes.....	"



APPENDIX D

DEPARTMENT OF INLAND REVENUE
LABORATORY BRANCH

BY

A. MCGILL, B.A., B.Sc., LL.D., F.R.S.C.
Chief Analyst

FEDERAL INSPECTION OF FOODS AND DRUGS IN CANADA

These laboratories, as has been already mentioned in previous reports, are concerned with the technical problems involved in the administration of the following Acts of Parliament, which have been placed under the care of the Department of Inland Revenue.

The Adulteration Act.

The Fertilizers Act.

The Commercial Feeding Stuffs Act.

The Proprietary and Patent Medicines Act.

The Inland Revenue Act.

The main laboratories are situated at Ottawa. Sub-laboratories have recently been established at Halifax, Winnipeg, and Vancouver; locations which are favourably situated as regards the geographical extent of Canada. It may be necessary, in the future, to increase the number of these sub-laboratories, having regard to density of population, manufacturing industries, and ports of entry. In such event, it is evident that the cities of Montreal and Toronto would have to be recognized.

So far as the first three Acts named above are concerned, our work is published in bulletin form and my last report enumerated the bulletins issued between February, 1914, and May, 1915. The following is a list of those published to this date:—

	Number of samples
Bulletin No. 315 Tincture of Opium.....	127
316 Native Wines.....	187
317 Fertilizers.....	420
318 Milk in smaller towns and villages....	209
319 Chop Feed.....	149
320 Table Syrups.....	200
321 Lime Juice.....	83
322 Maple confections.....	58
323 Saltpetre.....	166
324 Maple Sugar.....	234
325 Maple Syrup.....	243
326 Malt Extracts.....	152
327 Bleaching Powder.....	101
328 Salad Oil.....	159
329 Barley-pot and pearl.....	191
330 Breakfast Foods.....	33

		Number of samples
Bulletin No. 331	Turpentine.....	212
332	Linseed Oil.....	210
333	Formalin.....	68
334	Butter.....	138
335	Cream of Tartar.....	180
336	Tincture of Ginger.....	65
337	Lemon Flavouring Extract.....	223
338	Sausages.....	142
339	Sweet Spirits of Nitre.....	85

To the performance of the above work the sub-laboratories have contributed a fair share, and have already demonstrated the advantage of localization. That situated at Halifax has been in commission since December, 1914, in charge of Mr. C. C. Forward, with Mr. A. J. Landry as assistant since August, 1915. The Winnipeg sub-laboratory has been working since April, 1915, with Mr. E. L. C. Forster in charge. Mr. W. A. Davidson was sent out as assistant in September of that year. At Vancouver, Mr. J. A. Dawson is in charge since February, 1915, with Mr. P. T. Kirwan as assistant from August of that year. With exception of the Winnipeg sub-laboratory, which is established in the Post-Office building at corner of Main and Magnus streets, the present accommodation of these sub-laboratories must be regarded as temporary. Arrangements have been made at Vancouver for rooms in the projected new Post Office; but building operations are not as yet begun.

The published work above referred to furnishes as full an account as possible of the particular classes of foods, drugs, etc., named, so far as Canadian markets are concerned; and the Department seeks to secure the widest possible circulation of these reports. It is pleasing to note that the public press of Canada shows a constantly increasing readiness to publish abstracts from our reports, and to comment editorially upon them. In this way our work is coming to be widely known not only to manufacturers and dealers, but to the reading public at large. The Acts named have been created in the interest, primarily, of the consumer and user of foods, drugs, fertilizers, cattle feeds, etc.; and it is desirable that the public should be made aware of the manner in which they are administered. With this in view, an effort is made to present the results of analysis in a manner as little technical as possible, while at the same time furnishing the data upon which the judgment of the Chief Analyst is based.

During the past year especially, but to a large extent in every year, the services of these laboratories are called upon by various government departments, particularly by the Departments of Militia and Defence, of Agriculture, and of Marine and Fisheries.

An amendment to the Adulteration Act dated 12th June, 1914, became effective from 1st January, 1915 (G. 1152); and a later amendment (5 George V, Chap. 9) was assented to 15th April, 1915. The Adulteration Act has become so complicated by its many amendments, and experience has demonstrated the need of so many further changes and additions that the desirability of having it thoroughly revised must be accepted as proven. It is hoped that this work may be undertaken and accomplished at the next session of Parliament.

The only legislation affecting Food Standards during the year has regard to a reduction in the permissible moisture in Evaporated Apples (G. 1238 amending G. 1044).

Ottawa, May 27th, 1916.

APPENDIX E

DEPARTMENT OF THE INTERIOR, FORESTRY BRANCH

FOREST PRODUCTS LABORATORIES

BY

JOHN S. BATES, CHEM. E., PH.D.

Superintendent

REPORT OF THE FOREST PRODUCTS LABORATORIES OF CANADA FOR THE YEAR 1915-16

(Established in 1913 under the Forestry Branch of the Department of the Interior and located at McGill University.)

On April 1st, 1915, the permanent staff totalled twenty-three made up of seventeen technical men and assistants, and six office assistants. At the end of the year, March 31, 1915, the staff numbered thirty-two of whom twenty-six were engaged in technical work and six in office work.

A favourable start has been made on an exhibit of forest products. A considerable number of specimens have been collected illustrating wood-destroying fungi, wood treated with preservatives, timber test specimens, materials used in the pulp and paper industry, etc. Some fifty-seven Canadian tree species have been produced in the form of logs which are being used for the preparation of wood specimens for exhibit and for distribution.

TIMBER PHYSICS

The personnel of the Division of Timber Physics now includes a wood technologist, a photographic chemist, and a laboratory assistant. The attention of this division has been devoted mainly to the determination of physical and structural properties of wood which has undergone mechanical test in the Division of Timber Tests. The miscellaneous work done by this division includes a preliminary study of "rotholz," a new selective stain for pulp fibres, the examination of discoloured birch, identification of fibres and wood, fibre dimensions of Douglas fir, etc.

TIMBER TESTS

Most of the time during the year has been spent in the testing of small, clear specimens of Douglas fir and of mine props and booms in commercial size from Nova Scotia. A certain amount of miscellaneous testing has been carried out to compare the relative strength of green and kiln-dried wood, to find the relation of moisture to strength and to get an idea of the effect of "rotholz" on strength. These miscellaneous tests totalled 164.

PULP AND PAPER

A good many improvements were made in the experimental paper mill by the installing of further equipment and the fitting up of a laboratory for chemical studies and small scale experiments on wood and pulp. Progress has been made in the special investigations of waste sulphite liquor, beating, blotting paper, pulpwood measurements, and the chemistry of wood and pulp. The first sheet of paper was run over the experimental paper machine on May 27, 1915, and the other paper-making equipment has been put into operation during the year. Miscellaneous tests have been made, such as the beating of leather-board stock, the examination of pulp fibres submitted by outside parties, bleach tests, testing of Canadian china clay, etc.

WOOD PRESERVATION

At the close of the year the staff included a chief, assistant chief, engineer, and pathologist. The preservation laboratory has been provided with a fairly complete equipment for the study of wood preservatives and the preservative treatment of wood on a large experimental scale. In the pathological laboratory one small room has been put in shape for the study of wood-destroying fungi and the adjoining room has been altered to serve as a fungus pit. Special investigations of railway ties, paving blocks, fence posts, and durability of wood have been started. Miscellaneous work has been done on distillation studies of various creosotes used as wood preservatives, the examination of decaying timber in factory buildings, the collecting of fungus specimens, effect of fungus attack on wood, and reviews of technical literature.

The following is a brief summary of the special studies that are being carried on:—

1. Testing clear specimens. This is a comprehensive investigation designed to include ultimately all the important Canadian wood species and provide reliable data on their mechanical, physical, and structural properties. Douglas fir from three localities in Alberta and British Columbia has been under test since September, 1914, the actual testing having been completed in February of this year. It appears that Canadian grown Douglas fir has substantially the same properties as that which grows in the United States. Our forester has collected the necessary logs for the testing of four eastern species—black spruce (including so-called "grey spruce") and white spruce from the Province of Quebec and white pine and red pine from Ontario.

2. Nova Scotia mine timbers. A general investigation of Nova Scotia mine timbers has been carried on co-operatively by the Forestry Branch and the Mining Department of McGill University. The Forest Products Laboratories have been engaged in the mechanical testing of the timber, studying the effect of fungus attack, considering methods for preservative treatment, etc. The species covered are black spruce, red spruce, and balsam fir which are now being used in the coal mines in the east, and yellow birch, white birch, and jack pine which have been suggested to supplement the supply.

3. Vapour pressure and shrinkage. Plans were made some time ago to study the variation in the moisture content of wood with the changing humidity of the atmosphere at various temperatures and the relation between the shrinkage of wood and change in moisture content. Special apparatus has been designed and procured and preliminary experiments have been made but the investigations had to be given up for the time being on account of the enlistment of technical men for active service.

4. Wood pulp beating. The object of this investigation is to study the factors connected with the proper beating of paper pulp. During the year the single and double experimental beaters have been put into shape and plans have been made for carrying out the work.

5. Waste sulphite liquor. Research work was started last summer by Mr. J. A. McRae, of Queens University, on the chemical characteristics and composition of waste sulphite liquor. This is a very difficult field of research and it appears that more ample provision will have to be made if results are to be expected which will point to a satisfactory utilization of this pulp-making by-product. An extensive set of abstracts of the technical literature has been prepared.

6. Chemistry of wood and pulp. The object is to study the chemical characteristics of Canadian pulp woods with special reference to their pulp-making qualities. The work up to the present has been along the lines of comparing methods of analysis and devising new methods for the determination of cellulose, lignin, resin, and other constituents of wood and pulp. Studies are being made of pulp produced in small digesters, special attention being given to spruce and balsam fir.

7. Blotting paper. Some attention has been given to the manufacture of blotting paper, as only small quantities of the cheaper grades are at present made in Canada. Samples of blotting paper from various foreign sources have been examined. A satisfactory procedure was worked out for the treating of cotton and linen rags and

very good grades of blotting paper have been produced on the experimental paper machine.

8. Pulpwood. The object of this investigation is to study the feasibility of barking, chipping, drying and baling pulpwood near the logging operations and shipping the bales to the mills for the manufacture of chemical pulp. In connection with this work it was necessary to determine such data as average weight green and dry of a cord of rough pulpwood, loss on roasting, weight of a full cord of peeled wood, volume of solid wood per cord, yield of good chips from a cord of pulpwood, weight of chips loose and packed per cubic foot, rate of air drying of chips, shrinkage on drying, etc. This information should be of practical interest to the pulp and paper industry. Preliminary baling experiments have been made and this problem together with the commercial drying of pulpwood chips is in the hands of one of the companies with whom we are co-operating.

9. Durability of wood. The lack of definite information regarding the natural durability of the important commercial species of Canadian woods is a handicap in selecting timber for various structural purposes. Plans are now in hand for a study of the relative durability of a few Canadian tree species. This work will include accelerated rotting tests of wood specimens and other laboratory studies to determine the susceptibility of untreated woods to fungus attack.

10. Railway ties. This investigation is intended to cover the problems relating to preservative treatment of railway ties under Canadian conditions. The plans include experimental treatment of tie timber and service tests of treated ties in track. A considerable amount of preliminary work has been completed during the year and the problem has been taken up in co-operation with officials of the Canadian railroads.

11. Paving blocks. The merits of treated wood-block paving for city streets and factory floors and the abundance of raw material in Canada points to a greatly extended use of wood for paving purposes in the future. These laboratories have in mind a continuous investigation of this subject, involving experimental preservative treatment of wood-block material and service tests of treated blocks. Considerable information has been gathered and a general discussion was given in Forestry Branch Bulletin 49, "Treated Wood-Block Paving." A number of inspections have been made of wood pavements in Canadian cities during the past year. A supply of Norway pine has been procured for laboratory tests on this promising species.

12. Potash. Owing to the cutting off of German supplies of potash for fertilizer and industrial purposes, attention has been turned to the old process of recovering potash from wood ashes. Information has been obtained and a number of analyses have been made. The total amount of potash is not very great, but several firms are taking the opportunity for recovery during the present period of high prices.

13. Acetone. Several of the chemists of our staff have devoted considerable time during the past months to the study of acetone which is required in such large amounts for war purposes. We have co-operated with the hardwood distillation companies and the cordite manufacturers in producing and testing new solvents. Most encouraging progress has been made and the results have been submitted regularly to representatives of the British war office.

14. Oils for ore flotation. The mining interests recently requested the co-operation of these laboratories in the production of Canadian wood oils which may be suitable in the new and important flotation process for treating low grade ores. The Mines Branch has arranged to make flotation tests on oils submitted. Plans are being made for the study of resinous wood distillation and other processes which may yield oils on a commercial basis for flotation purposes.





LUDGER DUVERNAY

Mémoires de la Société Royale du Canada

SECTION I

SÉRIE III

JUIN 1916

VOL. X

La Saint-Jean-Baptiste, 1636-1836

Par BENJAMIN SULTE, M.S.R.C.

(Lu à la réunion de mai 1916)

Au lieu de reporter l'origine de notre fête nationale à 1834, souvenons-nous qu'on la célébrait avec ardeur dans les paroisses du Bas-Canada en 1734 et que cette coutume existait déjà parmi nous en 1634, ayant été importée de France, où elle régnait depuis des siècles. C'est ainsi que l'on remonte au déluge pour expliquer un fait moderne. La Saint-Jean Baptiste est plus ancienne que saint Jean-Baptiste lui-même.

I.

L'usage de s'assembler pour se réjouir date des premières générations humaines puisque, au contraire des animaux, nous possédons le privilège de la gaité, de la parole, du rire et de l'esprit, toutes choses dont les hommes se sont aperçus dès les temps adamiques. Dès que l'individu se reconnaît une faculté il cherche à la mettre en œuvre. Or, l'idée religieuse attirait davantage en ces jours primitifs,

Lorsque le genre humain se nourrissait de glands, et l'on fixa au solstice d'été, l'hommage général que l'instinct premier voulait rendre au créateur du monde. Les plus longs et les plus beaux jours de l'année devenaient ainsi comme marqués à part, consacrés à la vénération de la lumière, au culte du soleil, à l'élévation vers Dieu et aux réjouissances que cette pensée provoquait naturellement. Que l'état de barbarie dans laquelle vivaient les hommes ait empêché la fête de revêtir un caractère aussi religieux que nous le concevons aujourd'hui cela est certain, et que de grossiers ébats aient existés en place d'une cérémonie solennelle et bien ordonnée, c'est encore vrai, mais le fond était trouvé et chaque retour de la grande lumière annuelle apportait ses divertissements.

Les Perses, par la suite, et aussi d'autres peuples de l'antiquité, honoraient la puissance suprême sous l'image du feu. Tant que l'humanité n'a pas connu le christianisme elle a été fidèle à cette

superstition qui est, après tout, assez raisonnable puisqu'elle constituait un culte rendu au Dieu ignoré. Le feu étant considéré source de la vie, on l'adorait, faute de connaître son créateur.

En Grèce, aussi loin que nous pouvons reculer, le peuple allumait des torches à l'intention de Mercure, Vulcain, Minerve, etc., divinités supposées que l'on disait avoir doté les hommes des bienfaits de la lumière, de l'huile et du feu.

A Rome, dans ces sortes de fêtes, les feux de joie étaient accompagnés d'une pompe incroyable. On enflammait des bûchers immenses et, dans les plus grandioses processions, on y jetait, comme victimes de sacrifice, des taureaux, des brebis, des objets de toute nature.

Les peuplades celtiques, Bretagne, Irlande, Écosse, midi de la France pareillement, ont conservé la tradition de ces feux jusqu'à nos jours, comme au Canada durant les deux derniers siècles.,

Dans les provinces bretonnes, le vocable de "la Saint-Jean" paraît avoir été adopté depuis le moment où le christianisme y a remplacé les vieilles croyances.

Les Gaulois plaçaient des feux sur les hautes terres, les montagnes, les bords de l'océan, comme signes de réjouissances publiques. Les gens du pays de Galles, en Angleterre, ont encore cette coutume. Ajoutons qu'ils parlent un dialecte si rapproché de celui de la Bretagne française qu'ils conversent encore avec les Bretons très facilement, à l'époque où nous sommes.

Voilà des reliques du temps passé qui frappent l'imagination de quiconque a lu les récits de vingt siècles disparus. La mémoire de ces populations n'en a rien gardé de précis mais, dans la pratique, les us et coutumes se continuent, sans savoir pourquoi ni d'où cela vient.

Le christianisme, prudent et habile, se bâsant par occasion sur les habitudes enracinées et les faisant tourner à son profit, ne heurtait point de front ce qui plaisait à l'élément populaire, il se contentait de lui imprimer son cachet religieux, ce qui le rendait doublement cher aux multitudes et relevait les anciennes coutumes en leur donnant un sens mystique. Ainsi, il plaça sous l'invocation de saint Jean-Baptiste les feux de solstice d'été, qui déjà avaient perdu leur interprétation païenne mais n'en subsistaient pas moins dans toute l'ardeur d'autrefois. L'Église, en changeant le caractère des bûchers et autres illuminations pour les faire servir à commémorer l'œuvre du Précurseur, supprimait l'idolâtrie et imposait une date chrétienne à ce qui avait toujours été ou très vague ou en grande partie fantaisiste.

Plus tard, au moyen âge, lorsque les serfs ou masses de la nation furent privés de liberté, la religion multiplia ses fêtes, qui obligeraient les seigneurs à suspendre le travail manuel. Ces nombreux jours de repos, contre lesquels on s'est gendarmé si fortement par la suite, étaient tous au bénéfice de nos pères les Gaulois asservis sous le joug des Francs—qui étaient les Prussiens de ce temps là. Ceux qui ont placé le coq gaulois sur le clocher de nos églises n'étaient pas indifférents aux besoins du peuple.

On ne songe pas, généralement, jusqu'à quel point les pratiques populaires sont tenaces. Le cas qui nous occupe est remarquable. En France, disent les anciens auteurs, du moment où quelqu'un apportait une bonne nouvelle, on s'écriait à la ronde: "Faisons les feux," ce qui signifiait: "Grande réjouissance, allumons pour la fête."

Voici un extrait d'un *Voyage à Paris*, année 1657, par deux Hollandais du nom assez français de Villiers, qui racontent leur journée du 22 juin: "En allant par la place de Grève nous vîmes qu'on y faisait de grands préparatifs de feux d'artifice pour la veille de la Saint-Jean, qu'on devait allumer sur le soir. La maison-de-ville était fort bien tapissée par dehors et par dedans. Messieurs de la ville y donnèrent une belle collation de confitures au gouverneur, aux principaux officiers et aux dames des plus relevées." Le gouverneur de Paris, escorté de la milice sous les armes, tambours battants, enseignes déployées, alla mettre le feu à la machine. Les voyageurs ajoutent: "On a une superstition particulière pour cette fête de la Saint-Jean et telle qu'il n'y a presque pas un gentilhomme ou un bourgeois qui porte le nom de ce Saint qui ne fasse ce jour-là un feu devant sa porte."

Le *Magasin Pittoresque* (1837 je crois) renferme une gravure représentant des paysans français dansant autour des feux de la Saint-Jean sur la place du village. Ces brasiers sont par petits tas, à distance les uns des autres, et la ronde circule en tous sens à travers leur étendue. Les fiancés, se tenant d'une main ensemble, sautent par dessus les tisons enflammés aux acclamations des bandes joyeuses.

Enfin, la Saint-Jean, ou plutôt son origine, est vieille comme le monde; elle est en vigueur dans cette partie de la France d'où nous venons; elle subsiste au Canada depuis le commencement de la colonie.

II.

La première mention du "feu de la Saint-Jean" au Canada se trouve dans la *Relation* de 1636. La population blanche ne dépassait pas 170 âmes et elle était arrivée depuis seulement 1633 en majeure partie. A Québec, le 23 juin au soir "sur les huit heures et demie, le

gouverneur (Montmagny) envoya M. Tronquet (son secrétaire) pour savoir si nous (les Pères Jésuites) irions. Nous allâmes le trouver, le Père Vimont et moi, dans le fort. Nous allâmes ensemble au feu. M. le gouverneur l'y mit. Lorsqu'il le mettait, je chantai le *Ut quænt Laxis* et puis l'oraison. . . . On tira cinq coups de canon et on fit deux ou trois fois la décharge de mousquet. Nous en retournâmes entre 9 et 10 heures." Le Père Le Jeune dit de plus: "Un Sauvage croyait qu'on faisait cette fête pour chasser le manitou et disait que nous entendions bien mieux l'éloigner et le bannir de nous que non pas eux, c'est pourquoi nous vivions plus longtemps. Cela me confirme dans l'opinion que j'ai qu'ils font leurs tintamarres et battent leurs tambours pour chasser le diable afin qu'il ne tue pas les malades. Je crains que, l'un de ces jours, ils ne nous viennent prier de tirer nos canons pour les guérir."

En 1647 le Père Jérôme Lallemant n'assiste pas au feu de la Saint-Jean "qui se fit comme l'an passé." C'est M. de Saint-Sauveur, prêtre séculier qui officie.

"Le 23 juin 1648, le feu se fit à l'ordinaire, note le Père Jérôme Lallemant. J'y assistai, ainsi que le Père Le Jeune et le Père Greslon. M. le gouverneur me vint quérir sur les huit heures et demie. Nous allâmes promener en son jardin et, sur les neuf heures un quart, nous allâmes au feu. M. le gouverneur (Montmagny) le mit à son ordinaire. J'y chantai l'*Ut quænt laxis* après le feu mis, le *Benedictus* et l'oraison de saint Jean, le *Dominus salvum fac regem* et l'oraison du roi, le tout sans surplis. Nous en retournâmes à dix heures."

Les changements "politiques" survenus en 1648 sont visibles dans les lignes suivantes du *Journal des Jésuites*: "On ne fit point de feu à la Saint-Jean aux Trois-Rivières en 1649, le gouverneur (Dailleboust) prétendant que le magasin (des Cent-Associés) le devait faire, et le magasin s'en remettant au gouverneur. On en fit à Québec; ce fut le Père Vimont au défaut d'autre."

Les Cent-Associés n'allaient plus que d'une jambe. La compagnie dite des Habitants pliait sous les dettes. Les Iroquois ravaient le pays. La traite était réduite à presque rien. Le parti de Montréal avait fait rappeler le gouverneur de Montmagny et nommer à sa place l'un des siens, comme aussi aux Trois-Rivières où les colons devenaient assez nombreux. Tout cela explique le désaccord du magasin et du nouveau gouverneur, mais il est évident que la fête du 24 juin était implantée dans la colonie.

Le Père Jérôme Lallemant était d'opinion que le supérieur des Jésuites devait se dispenser de prendre part au feu, laissant cette fonction à un autre prêtre. "Le 23 juin 1650, dit-il, le feu de la Saint-Jean, duquel je m'excusai prévoyant qu'on m'y ferait mettre le feu

à l'ordinaire et ne jugeant pas à propos de laisser courir cette coutume qui n'avait point été pratiquée (par le supérieur des Jésuites) du temps de M. de Montmagny. Ce fut M. le gouverneur (d'Ailleboust) qui y mit le feu. Le Père Delaplace y assista en surplis et étole, avec Saint-Martin pour y chanter le *Te Deum*."

Le 22 juin 1661, le grand sénécal Jean de Lauzon fut tué, avec plusieurs hommes, par les Iroquois, à l'île d'Orléans. On les inhuma le 24 juin, jour de la Saint-Jean Baptiste. A cause de cette circonstance douloureuse il n'y eut pas de feu d'artifice.

Une dernière mention fera voir que la fête se perpétuait avec le même cérémonial.

"La solennité du feu de la Saint-Jean se fit, en 1666, avec toutes les magnificences possibles, monseigneur l'évêque, revêtu pontificalement, avec tout le clergé, nos Pères en surplis, etc. Il présente le flambeau de cire blanche à M. de Tracy, qui le lui rend et l'oblige à mettre le feu le premier." Le Père Le Mercier ne dit pas s'il y avait en parade ou garde d'honneur des soldats du régiment de Carignan arrivés l'année précédente, mais on peut être certains qu'il s'en trouvait bon nombre parmi les spectateurs. Le pompeux marquis de Tracy, vice-roi, Mgr de Laval et probablement des membres du Conseil Souverain de la colonie, que veut-on de plus en pareille occasion ?

Si les cahiers du *Journal des Jésuites* postérieurs à 1666 étaient devant nous, peut-être que l'on saurait en quel temps cette fête à ciel-ouvert s'est discontinuée. Elle a dû rester la même jusqu'au moment où plusieurs groupes de colons formant des noyaux de paroisses, un peu partout, autour de Québec et des Trois-Rivières, y ont transporté la fête du feu, avec moins de décorum, cela se comprend, et donnant prise à des abus qui ont induit le clergé, comme les autres dignitaires, à cesser d'y prendre part. Mais le populaire n'en a que plus passionnément suivi la vieille coutume à la mode de France.

Une note en passant, qui n'est peut-être pas sans signification: le 21 avril 1692 le conseil supérieur de Québec revoye une affaire qui est devant lui "au premier lundi d'après la Saint-Jean Baptiste prochain."

On observera que, de 1636 à 1666, il n'est question ni de messe, ni de sermon approprié, ni de procession le 24 juin. Tout se passe en plein air le 23 au soir. C'est un feu-de-joie, plus ou moins accompagné de démonstrations en règle et imposantes.

La Saint-Jean-Baptiste a donc son histoire parmi nous dès le début de la Nouvelle-France. Ceci n'est point contestable. Elle a perdu à la longue dans beaucoup d'endroits, son caractère religieux pour s'en tenir à la forme populaire, puis, un jour, on ne saurait en

fixer la date, elle a repris son union avec l'Eglise, comme nous le verrons dans le présent article.

N'oublions pas que la Saint-Joseph était célébrée, dès 1638, comme celle du patron du Canada, avec feu-de-joie tout ainsi que la Saint-Jean, le 19 mars de chaque année. Après 1666 nous en perdons la trace en tant que cérémonie populaire mais l'Eglise l'a toujours conservée telle qu'elle est de nos jours.¹ Il va sans dire que l'éclat de la belle saison devait favoriser la Saint-Jean, tandis que les giboulées de mars ne se prêtaient guère à des célébrations de la Saint-Joseph en plein vent.

III.

Une autre célébration très en faveur dans les campagnes canadiennes était la fête de chaque paroisse. On y allait grand jeu, tant et si bien que le clergé s'en alarma, y voyant avec raison un sujet d'abus de conduite, souvent de discorde, surtout lorsque les paroissiens d'une autre localité se mêlaient à ceux de l'endroit qui faisaient leur démonstration annuelle. Les parentés attiraient en ces occasions trop de survenants pour que la paix ne fût pas un peu troublée, sans compter les excès de boire, festins et danses que l'occasion provoquait parmi les bons habitants de la paroisse en fête. Au début de la guerre de Sept Ans, l'année 1755, Mgr. de Pontbriand supprima les jours fériés de deux villages connus par leurs extravagances en ce genre. Le motivé de son interdiction est sévère. Il s'en prit également aux réjouissances excessives des corps de métiers, telles que la Saint-Eloi, patron des ouvriers en fer, la Saint-Thibault, des faiseurs de charbon de bois, toutes vieilles coutumes qui remontaient au moyen âge, au temps des jurandes et des corporations de métiers, ce qui fait voir, une fois de plus, que nos ancêtres avaient apporté de France nombre de pratiques populaires autres que la Saint-Jean-Baptiste. Ces anciennes habitudes avaient des racines profondes qui ne cédèrent pas facilement et il s'écoula deux ou trois générations avant que de les voir disparaître.

Lorsque, vers 1803, Mgr. Denaut condamna la fête de Beauport, on sait le tapage qui s'en suivit. Une section de la paroisse se rebella dans les règles. La justice intervint. Ce fut toute une affaire et, comme me disait un vieillard, on en parla jusqu'à Montréal qui était alors le bout du monde pour les gens de Québec. Les tribunaux se prononcèrent, il fallut obéir, mais les têtes se courbèrent avec lenteur—et il y eut des chansons pour conserver le souvenir de cette épopée.

¹ *Bulletin des Recherches*, 1916, p. 77.

Au fur et à mesure que l'à-propos s'en présentait, nos évêques enrayaient ces manifestations peu édifiantes, qu'il ne faut pas confondre avec la Saint-Jean-Baptiste. Mgr. Signaï, intronisé en 1833, y porta la dernière main—ce qui donne quatre-vingts ans de travail de réforme et d'épuration de la part de l'épiscopat dans cette branche de la morale publique. Ainsi, adieu les grandes gogailles, les voisinages par bandes où des paroisses entières s'invitaient, se festoyaient et se donnaient "du bon temps" assez répréhensible—un branle-bas général où toute "la côte" était en l'air.

Nous avons de plus la Saint-Louis que la noblesse et la classe bourgeoise devaient chômer du temps des Français, mais je n'en ai rencontré nulle trace. La supposition en est plus certaine que douteuse. Quant au peuple, sa fête "nationale" restait la Saint-Jean-Baptiste, bien qu'elle n'eut pas encore été "nationalisée" par Duvernay.

Notons que, dans le comté de Terrebonne, il y a cent ans, et jusque vers 1860, la date de la Saint-Louis donnait lieu à une importante foire aux chevaux. C'était l'occasion d'une série de fêtes qui duraient trois ou quatre jours.

Un fait assez curieux, c'est que, vers 1825, quelques citoyens de Québec conçurent le projet de créer une fête nationale et d'adopter dans ce but le 15 août—la Saint-Louis tout bonnement, mais l'organisation ne s'étendit pas en dehors d'un certain milieu appartenant à la classe commerciale et parmi ceux qui étaient ouvertement hostiles au régime politique du temps. On cite, cependant, la participation des entrepreneurs et des ouvriers du faubourg Saint-Roch, qui entrèrent dans le cercle en bon nombre. Après 1834 on n'en voit plus rien.

N'est-ce pas vers 1820 que se forma, à Québec, une sorte de "club" bonapartiste dont l'existence fut de courte durée?

IV.

Monsieur de Gaspé a consacré la majeure partie d'un chapitre des *Anciens Canadiens* à nous parler de la Saint-Jean-Baptiste au XVIII^e siècle, dans les paroisses du bas du fleuve, et il revient sur ce sujet dans ses *Mémoires*.

"La fête, "dit-il," ne manquait pas d'attirer un grand concours de pèlerins, non-seulement des endroits voisins, mais des lieux les plus éloignés. . . . Il se faisait de grands préparatifs dans chaque famille pour cette occasion solennelle. On faisait partout le grand ménage, on blanchissait à la chaux, on lavait les planchers qu'on recouvrait de branches d'épinettes, on tuait le veau gras, et le marchand avait bon débit de ses boissons. . . . Le seigneur offrait le pain bénit. . . . Ce n'était pas petite besogne que la confec-

tion de ce pain bénit et de ses accessoires de *cousins* pour la multitude qui se pressait, non seulement dans l'église, mais aussi en dehors du temple."

"Il était entendu que le seigneur et ses amis dînaient, ce jour-là, au presbytère, et que le curé et les siens soupaient au manoir seigneurial. . . . De tous côtés s'élevaient des abris, couverts de branches d'érable et de bois résineux où l'on débitait des rafraîchissements. Les traiteurs criaient sans cesse, d'une voix monotone, en accentuant fortement le premier et dernier mot: "A la bonne bière! Au bon raisin! A la bonne *pinprenelle*!"—et les papas et les jeunes a moureux stimulés pour l'occasion, tiraient avec lenteur, du fond de leur gousset, de quoi régaler les enfants et la *créature*."

Le pain bénit, le curé, ceci fait voir qu'il se disait une grande messe, mais depuis quand la coutume en était établie c'est à nous de faire des conjectures.

Le docteur Hubert La Rue nous raconte de quelle façon cette fête était célébrée à l'île d'Orléans au commencement du XIXe siècle: "C'était le soir du 23 juin qu'avait lieu le feu de joie. Sur l'ordre du seigneur (paroisse Saint-Jean) un des habitants transportait sur la grève, en face de l'église, le bois nécessaire au feu—du cèdre invariablement. Après avoir chanté un salut, le curé, revêtu de l'étole, se rendait au bûcher, le bénissait et, ensuite, faisait du feu frappant le briquet avec un caillou. L'amadou ainsi enflammé, il mettait le feu au bûcher et quelque compagnie de miliciens faisait une décharge de fusils, au milieu des cris de la foule. Presque toute la population de l'île se donnait rendez-vous à Saint-Jean pour cette solennité. La coutume était de s'y rendre à cheval, les femmes en croupe derrière leurs maris."

Je n'ai rien d'aussi pompeux à rapporter touchant les paroisses situées au-dessus de Québec, mais à Saint-Jean d'Echaillons, aux Trois-Rivières, autour de cette ville j'ai vu (1850) bien des feux de la Saint-Jean qui ne devaient rien à l'inspiration de Duvernay car ils étaient de tradition ancienne. Ces feux, sur le bord du fleuve se regardaient les uns les autres. Tout le pays était en fête. Au collège de Nicolet, grand congé, pique-nique, promenade sur l'eau. Partout la première baignade de la saison, dans le fleuve, en bandes, aux éclats des chansons et de la gaité générale.

V.

L'agitation politique de 1834, dans la Nouvelle-Écosse, le Bas-Canada, le Haut-Canada, fit naître bien des projets parmi lesquels se distingue l'idée d'une organisation de la Saint-Jean-Baptiste comme

centre de ralliement des patriotes. Étaient patriotes ceux qui demandaient des réformes dans le gouvernement de la province, à l'encontre du parti tout-puissant des bureaucrates qui ne voulaient rien céder de leurs privilèges. En d'autres termes, on réclamait des droits, tandis que ceux qui exerçaient le pouvoir par faveur spéciale se cramponnaient à leurs place et ne voulaient rien changer au mode d'administration qui s'était continué le même depuis 1763. Par les bureaux dont les membres dépendaient du ministère de Londres, toutes les affaires se trouvaient entre les mains de quelques familles qui n'étaient en aucune façon responsables au peuple. Nous avions une chambre législative à la nomination des comtés mais ses fonctions ne s'étendaient pas loin—d'ailleurs, tout comme la chambre des communes d'Angleterre. Comme en Angleterre aussi le pouvoir exécutif et le contrôle des finances étaient refusés à la chambre populaire. Des deux côtés de l'océan, le cri de réforme se faisait entendre depuis des années, sans résultat, et si l'on voyait la couronne s'obstiner à ne rien concéder, il n'en est pas moins étrange de dire, en toute exactitude que les réformateurs des Trois-Royaumes, de la Nouvelle-Écosse, du Bas-Canada, du Haut-Canada, se plaignant bien fort avec plein droit en vérité! n'ont jamais indiqué aucun remède à l'état de choses qui régnait depuis si longtemps. Les rois du temps passé, la reine Victoria, leurs conseillers, auraient pu comprendre la justice des réclamations mais, en admettant cela, ils ne savaient vraiment de quelle manière s'y prendre pour donner satisfaction aux mécontents, puisque ceux-ci se bornaient à vouloir un changement de régime sans indiquer un plan de transformation. Beaucoup de réformes à faire et, à mesure que le temps marchait, beaucoup de partisans de cette idée, sans savoir par quel procédé on parviendrait à tout mettre sur un pied acceptable. On en était à ce point embarrassant, on piétinait sur place en 1834 et, faute de conceptions admissibles, les hommes de là-bas, ceux d'ici, tous se regardaient d'un air rogue, éternisant les disputes, noyant les débats dans un déluge de mots, se faisant de la bile tous les jours, enfin tournant dans un cercle vicieux.

La conception qui devait finir par débrouiller ce chaos n'apparaît que vers 1840 et encore sous une forme nébuleuse qui se dégagea petit à petit et devint, autour de 1850, la responsabilité ministérielle. Son auteur n'est personne. Tout le monde y a plus ou moins contribué. Il n'y eut pas de découverte au vrai sens du mot.

Le nouvel édifice s'éleva-t-il dans l'ombre et le mystère? Oh! non, chacun le voyait grandir, mais nul n'y comprenait rien. Une fois fini, on lui donna un nom et ce nom disait que les vœux des réformateurs étaient accomplis par un procédé qu'eux-mêmes n'avaient

point deviné au temps de leur plus grande ferveur dans les combats.

Quand la reine, ou plutôt lord Melbourne, admit comme ministre un homme des Communes, à cause de sa popularité, aucun prophète n'annonça que ce moment était l'aurore des temps nouveaux —et pourtant c'était le lever du soleil.

Mais en 1834 nous étions dans les ténèbres, à Londres, comme à Québec. Aux yeux de Ludger Duvernay il était urgent de grouper les Canadiens pour leur donner plus de force en les inspirant d'une même pensée qui seraient à la fois nationale et un instrument politique. Les fêtes de métier, de la Saint-Louis, celles de la paroisse n'existaient plus. On avait table rase, sauf pour la Saint-Jean-Baptiste qui jouissait toujours d'une signification plus générale que toute autre. Il lui manquait un cadre, une organisation permanente, et c'est ce que Duvernay sut lui procurer. Sans rien dire dans la *Minerve* il prépara un banquet qui eut lieu à Montréal, le 24 juin 1834, dans le jardin¹ de M. John McDonell avocat, Irlandais d'origine, et plus de soixante personnes s'y trouvèrent présentes. Le restaurateur était Jehlen. Il y avait des lumières aux arbres, beaucoup de fleurs, répan-
dues partout et de la musique.

Les orateurs furent Jacques Viger, maire de la ville, président, John Turney, ancien conseiller de ville, vice-président, Louis-Hypolite La Fontaine, le docteur Edmund O'Callaghan, Thomas Starow Brown, Charles-Ovide Perreault, E. E. Rodier, le capitaine de Bleury, docteur Vallée et M. M. Le Tourneur, Sicotte, Laberge, Gosselin.

On fit un rapprochement entre les circonstances où l'on se trouvait et le choix de saint Jean-Baptiste comme patron "qui, il y a dix-huit siècles, est venu préparer la voie de la réforme morale." Le mot réforme tombait bien. Tous les convives étaient des admirateurs de Louis-Joseph Papineau qui venait de mettre devant l'assemblée législative les "92 Résolutions"—et partisans aussi de Joseph Howe qui soulevait la Nouvelle-Écosse contre l'absolutisme du gouvernement; de William Lyon Mackenzie qui luttait dans le Haut-Canada contre les mêmes abus; de Daniel O'Connell l'agitateur de l'Irlande et, dans le parlement de Londres ils comptaient pour alliés les réformistes Labouchère, Joseph Hume, John-Arthur Roebuck, Sir James Mackenzie, sir Thomas Burditt et plusieurs autres membres de talent.

Vingt-cinq santés sont énumérées dans le compte rendu que publia la *Minerve* le 26 juin:—1. le peuple source de toute autorité légitime; 2. la chambre d'assemblée; 3. Papineau; 4. Louis Bourdages; 5. Elzéar Bédard; 6. O'Connell; 7. Jocelyn Waller; (en

¹ Plaçons un monument à cet endroit.

silence); 8. Daniel Tracey et les trois victimes du 31 mai (en silence); 9. Denis-Benjamin Viger; 10. Hume, Roebuck et les libéraux du parlement de Londres; 11. W. Lyon Mackenzie et Marshall S. Bidwell; 12. Carson, Blanchard, Morris et les réformistes des colonies anglaises, 13. le gouvernement des États-Unis (il y avait des Américains présents); 14. La Fayette (en silence, il venait de mourir), 15. Joseph Papineau; 16. Jacques Viger et le conseil-de-ville, 17. Bonaventure Panet; 18. liberté de la presse; 19. *Le Canadien* de Québec; 20. l'immigration; 21. le clergé; 22. la convention du district de Montréal; 23. les assemblées constitutionnelles des trois districts qui ont soutenu l'assemblée législative; 24. Duvernay, président de la société *Aide-toi*, qui a donné l'idée de cette fête, et à toute la jeunesse; 25. William Evans, agronome.

Le maire Viger chanta trois couplets assez bien écrits qu'un anonyme lui avait adressés. John Turney chanta à son tour, puis vint George-Etienne Cartier avec trois couplets de sa composition; c'était *O Canada! mon pays mes amours*. On décida que le banquet serait annuel. La santé de Duvernay fut répétée en 1835.

La politique menait tout dans cette réunion. Peu d'années après, elle s'effaça par suite des événements, surtout après l'introduction du gouvernement responsable.

Pour celui qui connaît l'intensité de la crise par laquelle passait l'empire britannique à cette époque, le banquet ci-dessus présente un double intérêt.

Les voies étaient préparées. La Saint-Jean-Baptiste comptait une existence deux fois séculaires sur les bords du Saint-Laurent. Au lieu de créer, d'innover, d'improviser une célébration nationale à tout hasard, il suffisait de mettre en pratique avec plus de vigueur, un usage ancien, lui donner du relief, du corps, le diriger vers un but. "Heureux," dit Sainte-Beuve, "ceux qui sont d'un pays, d'une province, qui en ont le cachet, qui en ont gardé l'accent, qui font partie de son caractère." Or, le caractère des Canadiens se prêtait à la chose proposée.

Les mots: "fête de Saint-Jean-Baptiste" réveillaient chez les Canadiens des souvenirs profonds. C'était l'un des beaux jours que nos ancêtres aimaient à célébrer. En l'adoptant, Duvernay fit preuve d'instinct et d'un tact parfait, ce qui assura l'existence de son œuvre.

A l'instar de quelques citoyens de Québec qui avaient imaginé une fête de Saint-Louis inspirée de la politique de réforme, Duvernay offrait une fête nationale portant un nom vénéré et son coup d'œil était plus juste en cela que le choix de tout autre vocable ou souvenir qui ne disaient rien au peuple. Lui et ses collègues agirent avec la

même adresse à l'égard des emblèmes et de la devise qu'ils imposèrent à la Société.

Le banquet de 1835 eut lieu dans une salle décorée de fleurs et de branches de feuilles disposées en festons. Il y avait un bouquet ou faisceau de branches d'érable portant les plus belles feuilles.

En 1836 on célébra dans plusieurs paroisses du district de Montréal, notamment à Saint-Denis, Saint-Benoit, Boucherville, Saint-Ours, à la manière de la ville—banquet, discours, chansons. A Saint-Ours il y eut grande messe. C'était de beaucoup plus imposant que l'antique allumage du feu de joie par le prêtre, et la fête nationale se relevait en conséquence.

Aux agapes de 1836, à Montréal, monsieur Denis-Benjamin Viger, président, arrêta son attention sur l'érable et dit que cet arbre "qui croit dans les vallons, sur les rochers, d'abord frêle et battu par la tempête, languit en arrachant sa nourriture du sol qui l'a vu naître, mais ensuite il s'élance et devient grand, robuste, superbe, brave les orages et triomphe de l'aiglon qui ne peut plus l'ébranler. C'est le roi de nos forêts, c'est l'emblème du peuple canadien."

Quelques mois plus tard, *Le Canadien*, de Québec, changeait sa vignette de tête (un laboureur près de sa charrue et de ses bœufs) adoptant la feuille d'érable avec le castor. "Ces emblèmes," écrivait monsieur Etienne Parent, "n'ont guère besoin d'explication, car la feuille d'érable a été adopté pour le Bas-Canada, de même que la rose pour l'Angleterre, le chardon l'Écosse, et le trèfle l'Irlande."

Jusqu'à cette époque l'élément français avait été presque seul à se partager le sol de la province. La situation changea plus tard et plusieurs fêtes nationales se trouvèrent voisines les unes des autres, mais sans se faire concurrence. Les Anglais ont la Saint-Georges, les Gallois la Saint-David, les Ecossais la Saint-André, les Irlandais la Saint-Patrice et tout cela, avec la Saint-Jean-Baptiste, marche d'accord comme les régiments d'une grande armée. Tous sont Canadiens, aujourd'hui, conservant avec respect le souvenir de leurs pays d'origine.

La célébration de la nouvelle fête fut interrompue par les événements de 1837. Duvernay, et d'autres du même cercle, prirent le chemin de l'exil, mais en 1842, le fondateur étant de retour, il y eut réorganisation et propagande. Dès 1843, D.-B. Viger avait présidé une réunion avec George-Etienne Cartier comme secrétaire. Depuis ce moment la célébration annuelle s'est continuée.

Le service religieux du matin, avec sermon, ensuite la marche en procession furent adoptés à partir de 1844 et cet ensemble de cérémonial se répandit par toute la province, sans négliger le pain-béni,

les drapeaux, les discours, les banquets, les piques-niques, les jeux sur la pelouse, les promenades sur l'eau, la musique en plein air, les feux de joie, les concerts, etc.

VI.

Québec doit figurer dans ces notes parcequ'il n'a pas tardé à suivre le mouvement et à s'en emparer dans une grande proportion. Sir James Le Moyne raconte qu'il a assisté, en 1837, à la célébration du 24 juin, au Bois de Boulogne, bocage du capitaine Faucher, à Saint-Thomas de Montmagny. Louis-Joseph Papineau y était. Le docteur Etienne-Pascal Taché avait organisé la réunion. On y parla politique "pour propager les doctrines républicaines." Le *Canadien* publia un compte rendu "sympathique."

Le docteur Hubert La Rue s'applique à nous faire connaître ce qui concerne son "pays" en fait d'origine de la Saint-Jean-Baptiste: "Le père, le fondateur de cette Société à Québec a été monsieur Narcisse Aubin. Le 16 juin 1842, huit jours avant la fête et un an avant la réorganisation de la Société à Montréal. M. Aubin, dans le *Fantasque*, faisait un chaleureux appel au patriotisme des Canadiens-Français de Québec, leur disant qu'à Montréal, deux jours avaient suffi à monsieur Ludger Duvernay pour organiser (1834?) un banquet somptueux. L'article du *Fantasque* se terminait par ces mots "Ceux qui seraient disposés à célébrer la Saint-Jean-Baptiste sont priés de laisser leurs noms à ce bureau, d'ici à samedi prochain. Si, d'ici à ce temps, le nombre en était suffisant, une assemblée serait convoquée, afin de-nommer un comité, prendre les souscriptions et s'occuper des autres arrangements nécessaires."

"Cet appel fut entendu et, trois jours plus tard, le 19, une assemblée préliminaire eut lieu à l'hôtel Maheux, rue et faubourg Saint-Roch. A cette assemblée la Société Saint-Jean-Baptiste de Québec fut fondée et organisée."

Il y avait à cette réunion J. P. Plamondon, Olivier Fiset, P. Guenet, S. Marmette, Joseph-Charles Taché, Joseph Cauchon, Telesphore Fournier, F. M. Derome, W. H. Rowen, L. Mathieu, R. P. T. Lévesque, J. Grenier, H. Gingras, P. Gingras, P. Corriveau, J. Bureau, P. A. Gagnon, le docteur Tourangeau et autres. Le docteur Pierre-Martial Bardy fut nommé président, Narcisse Aubin J.-P. Rhéaume et . . Huston secrétaires.

Le dimanche, 19, au prône de la cathédrale, on avait annoncé la fête en l'honneur de la tempérance, un sujet qui était alors en vogue comme il l'est redevenu en 1916. Le 22, le *Canadien* parle du banquet. D'abord, on avait conçu l'idée de choisir l'hôtel de la *Cité*; un groupe se prononça pour l'hôtel *Albion*, ce qui amenait deux banquets simultanés. On finit par s'entendre aisément en faveur du *City Hotel*.

A six heures du matin, le 24, on forma la procession devant ce dernier hôtel pour arriver à la messe au coup de sept heures. La musique la *Canadienne*, sous la direction de monsieur Sauvageau, battait la marche. En tête se déployait une bannière aux couleurs verte, blanche, rouge, sur laquelle était représenté saint Jean-Baptiste et un castor peints par M. Légaré. Au milieu du défilé on voyait une autre bannière blanche portant: "Nos Institutions, notre Langue et nos Lois." Puis, six drapeaux de milice de 1812.

La température était superbe. Chaque membre de la procession avait sur la poitrine une feuille d'érable et un castor avec ruban rouge, vert et blanc.

Monsieur le curé, M. Charles-François Baillargeon célébra la messe et M. l'abbé Charles-Pascal-Télesphore Chiniquy prononça un sermon éloquent sur la tempérance dont il était l'apôtre reconnu. En réalité ce ne fut pas ce que nous appelons une messe de la Saint-Jean-Baptiste mais une occasion de prêcher la tempérance, et à cela "honni soit qui mal y pense."

Après l'office, la procession se remit en marche, parcourant plusieurs rues et enfin on brisa les rangs aux cris de "Vive la Reine, vive Jean-Baptiste."

Il se trouva que la *Cité* ne pouvait accommoder tous les convives dans une même salle, ni même dans un seul étage. Alors, va pour deux étages et l'on fit contre fortune bon cœur.

Donc, le soir du même jour, il y eut banquet de deux cents personnes, parmi lesquelles l'honorable René-Edouard Caron, maire de la ville, les honorables John Neilson et Thomas Aylwin, tous deux hommes politiques distingués. Le corps de musique *La Canadienne* épuisa son répertoire de compositions patriotiques. Les toasts se succédèrent avec tous les honneurs. Il y eut "une véritable avalanche de discours" dont les principaux par le président, le maire, MM. Cauchon, Belleau, Chauveau, Aylwin, Etienne Parent, Auguste Soulard et F. M. Derome. Le tout se termina vers minuit.

C'était un vendredi. Le repas fut tout en maigre. On était sous le régime de la tempérance. En dépit des nombreuses "santés," tous les convives restèrent sobres. "Il n'y eut d'autre chaleur intérieure que celle qui pouvait provenir d'un patriotisme brûlant." De l'eau, des limonades, de la bière de gingembre, de la sapinette ou petite-bière—liqueurs de tempérance. *Le Canadien* disait: "Nous nous sommes amusés aussi bien, peut-être mieux que si le vin eut ruisselé sur la table."

Le lendemain, sir Charles Bagot, gouverneur général, donnant une réception, la Société Saint-Jean-Baptiste y figura avec la Saint-George, la Saint-André, etc.

La *Gazette de Québec* signala, en faisant la lippe, les couleurs du principal drapeau de la procession: vert, blanc, rouge, qu'il déclare être un insigne révolutionnaire. *Le Canadien* lui répond dans les tons doux, qu'il a pris le vert pour le bleu et que le tricolore de Québec signifie: Foi, Espérance, Charité.

A ce propos, citons quelques lignes de M. Adolphe de Puibusque, écrits en 1858:

J'aime les oiseaux blancs qui charment vos hivers.
Le blanc, c'est la candeur, voile de l'innocence.
De vos grandes forêts j'aime les arbres verts.
Le vert, c'est le printemps, l'avenir, l'espérance.

La pièce est intitulée *Les Couleurs du Canada*. C'est de la pure fantaisie. Le vert et le blanc n'ont pas été employés de cette manière. La Société Saint-Jean-Baptiste marche sous le drapeau britannique.

VII.

Le premier ancêtre de Ludger Duvernay en Canada venait de Rouen. Il se nommait Christophe Crevier et sa femme Jeanne Enard. Je les trouve aux Trois-Rivières en 1639. Un de leurs fils, Jean-Baptiste—nom préordonné, dirait Bossuet, s'appela Duvernay, s'établit marchand à Montréal où il mourut en 1708. Son fils, Pierre demeura à Verchères. Le fils de celui-ci fut le premier notaire Duvernay de Varennes et son fils, le second notaire Duvernay, pratiqua à Verchères. C'est à Verchères que naquit Ludger Duvernay, le 22 janvier 1799.

En 1813 ce garçon était typographe dans l'atelier du *Spectateur*, à Montréal. Il y fit connaissance avec nombre de personnes qui l'entourèrent plus tard et agirent de concert avec lui.

Aux Trois-Rivières, de 1815 à 1825, il manifesta des qualités d'organisateur au-dessus de l'ordinaire. Tout imprimeur qu'il était on lui confia la voirie de la ville et, bientôt, il transforma les rues, en ouvrit de nouvelles et déploya une énergie rare, jointe à une faculté d'initiative dont on tirait d'heureux présages pour son avenir. La tradition ou plutôt le souvenir local que j'ai recueilli vers 1860, nous montre assez gaillardement de quelle manière il s'y prenait pour procurer à ses pompiers la prime offerte à l'activité, car il était chef d'une "compagnie du feu." Il faut savoir encore par quel procédé audacieux il supprima le vieil édifice du Marché, ce qui amena la construction d'un bâtiment plus spacieux, plus "moderne" et fit l'orgueil des citoyens. Comment il parvenait à faire vivre ses journaux des Trois-Rivières, cela nous reste à savoir mais s'ils mouraient s'était pour renaître au lendemain de l'enterrement, plus vigoureux

que jamais. Il en était parlé au loin : ses collaborateurs maniaient les meilleures plumes de Montréal et de Québec.

En 1826, il retournait à Montréal, vers l'automne probablement, pour prendre la direction de *La Minerve*, fondée récemment, mais qui manquait d'administration. Il était enfin dans son milieu et il tailla la besogne en grand. Ce qu'il en faisait n'était pas pour lui seul. D'abord, il était pétri de dévouement et ensuite il voulait stimuler l'esprit de résistance contre les injustices du pouvoir d'alors.

Pour s'assurer l'aide des Irlandais et avoir sous la main un journal de langue anglaise, il devint propriétaire du *Spectator* que rédigeait Jocelyn Waller. Les deux hommes furent arrêtés, en 1828, sous accusation de libelle politique. Il s'en suivit un mouvement populaire. Les choses allaient au désir de Duvernay qui s'offrait aux coups et calculait que plus il y aurait de tapage plus on avancerait dans la voie de la liberté politique. Il devint le personnage le plus en vue après Papineau.

Ses moyens étaient singuliers. Il consistaient à faire écrire des articles que le gouvernement ne laisserait jamais passer sans sévir. Dès que l'on recherchait l'auteur, Duvernay se présentait. On le retrouvait en pleine lumière tandis que les autres avaient ordre de rester dans l'ombre.

A l'occasion des troubles de 1832, à Montréal, il fut de nouveau emprisonné avec, cette fois, le docteur Daniel Tracy, rédacteur du *Vindicator*. Tant que dura la session de la législature, ils demeurèrent enfermés à Québec, puis on les relâcha. Arrêter ces hommes qui défendaient la cause populaire, les retenir sous clé, les libérer sans procès, tout cela montrait un piètre gouvernement, aussi quelle marche triomphale que celle des deux journalistes, à travers les paroisses de la rive nord, de Québec à Montréal.

L'idée de s'offrir en holocauste pour les siens est un trait de l'esprit de calcul et de l'originalité du caractère de Duvernay. Il entrait et sortait de prison entouré d'une auréole de défenseur du peuple. Son nom valait un drapeau, un signe de ralliement aux yeux des patriotes ou réformateurs des abus du passé et du présent. Chaque sortie de prison signifiait une défaite des autorités et l'on disait : "vous voyez que le gouvernement n'ose aller plus loin." Papineau parlait. Duvernay agissait.

Monsieur T. Frédéric Elliott, qui a été un jour assistant-secrétaire des colonies, écrivait, de Québec, en 1835 : "S'il est au monde un corps que l'on puisse traiter, sans crainte de faire erreur, selon ce qu'il mérite de blâme—et qui est-ce qui demanderait mieux?—c'est bien l'arrogant parti officiel du Canada. Dans la province (de Québec) même, il est très difficile de dire laquelle des grandes divisions

du peuple (anglaise ou française) a le plus d'éloignement pour ce parti. Le côté anglais a autant d'ambition pour dominer que le côté français et, selon moi, il est prêt à employer dans ce but des moyens moins scrupuleux, mais, ajoute-t-il, il ne marche pas avec les bureaucrates, il opère pour lui seul, à l'encontre des Canadiens. Si jamais ces effervescences allaient jusqu'à rompre le lien avec la mère-patrie, les Anglais seraient les premiers à le trancher."

Un fort courant existait dans la classe commerciale anglaise en faveur de l'annexion aux Etats-Unis, mais un silence prudent couvrait ce désir. Elliott continue: "Les Canadiens ne manqueront pas de s'apercevoir que les Anglais se sont emparés de toutes les richesses ainsi que du pouvoir, dans tous les pays où ils ont pu prendre pied."

En 1834, Duvernay n'espérait plus se faire mettre en prison, Une autre ressource se présenta à son esprit: il fonda la Société Saint-Jean-Baptiste . . . ce qui ne le priva point du plaisir d'être arrêté en 1836, à la suite d'articles parus dans *La Minerve*. Encore libéré et applaudi, inaccessible à l'intimidation, plus populaire que jamais, il fut élu, en 1837 par le comté de Lachesnaie, mais les troubles commençaient dans le district de Montréal et cette page d'histoire est connue. Duvernay se réfugia aux Etats-Unis, d'où il revint en 1842 continua de publier la *Minerve* avec succès et mourut à Montréal le 28 novembre 1852 toujours en évidence et respecté partout. Nous avons enfin les réformes politiques qu'il avait si courageusement demandées.

VIII.

La devise de la Société Saint-Jean-Baptiste est: "Nos institutions, notre langue et nos lois," emprunté au journal *Le Canadien* de 1831.

La feuille d'érable, à titre d'emblème appropriée aux Canadiens d'origine, c'est-à-dire français, doit avoir été ainsi considérée bien longtemps avant 1834 puisque *Le Canadien* du 29 novembre 1806 en parle comme d'une chose admise partout. A cette époque, *Le Mercure* portait le chardon d'Écosse et menait la guerre à l'élément français dans la politique. Voici le couplet ou épigramme dont il s'agit—c'est *le Canadien* qui l'imprime:

L'érable dit, un jour, à la ronce rampante:

"Aux passants pourquoi t'accrocher ?

"Quel profit, pauvre sotte, en comptes-tu tirer ?"

—"Aucun, lui répondit la plante:

"Je ne veux que les déchirer."

¹Le portrait qui accompagne cet article est fidèle. Il date des années du retour de l'exil.

Il était donc convenu, dès 1806, et probablement depuis des années, que l'érable nous personnifiait. En France, cet arbre est assez rare et le plus souvent d'un aspect misérable comparé au nôtre. Les premiers colons devaient l'admirer. Par la suite, vers 1685; il leur donna son fameux sucre et de cette manière il entra dans la famille. Sa feuille est de toute beauté. L'érable est le panache de la forêt canadienne, surtout en automne. L'éloge de son bois est dans le livre de Pierre Boucher, paru en 1664.

Dans les fêtes de 1834-1836, plus haut mentionnées, il n'est fait aucune mention du castor, mais on y parle de l'érable. En 1836, on adoptait le castor et la feuille d'érable. A partir de ce moment, les deux emblèmes se répandirent dans toutes nos paroisses.

Au sujet du castor, il s'est fait bien des commentaires, dans la presse, depuis 1880¹ pour savoir si c'était autrefois un insigne national et depuis quand nous l'employons ainsi.

La première apparition de cette figure allégorique est de 1632, alors que le roi d'Angleterre Charles I. l'accorda à Sir William Alexander en le créant baronnet de la Nouvelle-Écosse, où ce seigneur avait des établissements depuis 1621. La devise était: *Per mare, per terras*, applicable au genre amphibie de l'animal, de même qu'aux opérations du chevalier William par mer et par terre. Ce privilège du castor placé dans un écusson est personnel et n'a aucun caractère national. Dans la Grande-Bretagne, dix-huit familles ont aujourd'hui un castor mêlés à leurs armes. En Allemagne, les Ysebrant Beverwoorde, qui remontent à l'an 1300, portent le castor avec la devise *Per mare, per terras*. Une branche française de cette famille conserve encore le castor et la même devise. Tout cela n'est que souvenir du trafic des fourrures chez les nobles ancêtres de ces groupes d'individus nullement Canadiens. Le sceau des Pays-Bas, en 1632, portait pour toute marque un castor: commerce de fourrures avec Moscou et l'Amérique.

Aucune trace de l'emblème, depuis 1632 au 13 octobre 1673. C'est Frontenac qui s'en occupe en écrivant à Colbert: "Vous aviserez, s'il vous plaît, aux livrées et aux armes que le roi voudra donner à la ville de Québec. Je croirais que les fleurs de lys sans nombre, au chef d'or, chargé d'un castor de sable (couleur noire) lui conviendrait assez bien, avec deux originaux pour support, et le bleu et le blanc pour les livrées de la ville." Castor et originaux n'étaient pas difficiles à imaginer dans une ville et une colonie qui ne vivaient que du commerce des pelleteries, mais le projet resta dans les bureaux de

¹ *The Star*, Montréal, 20 janvier 1883. Voir aussi *Histoire des Canadiens-Français*, III, 132; IV, 128; VIII, 109, 110.

Versailles et, après tout, ce n'était qu'une application locale de l'idée du castor, le Canada ne pouvait en être affecté.

On a fait l'observation que la colonie ne possédait aucun autre signe distinctif que le drapeau français; cependant il n'existait point de drapeau français; celui du roi était peut-être arboré sur la maison de Frontenac; et si pavillon il y avait ailleurs il devait représenter la compagnie de traite qui jouissait du monopole de tous les négoces ou à peu près.

En 1670, il n'est pas fait mention d'emblème canadien sur la monnaie frappée pour cette colonie. La pièce est toute en l'honneur de Louis XIV; buste du roi avec devise: *Gloriam regni tui dicent*—on parlera de la gloire de ton règne. Talon avait proposé la frappe de cette monnaie et non pas la compagnie des Indes comme le dit Charlevoix.

Sur la médaille qui rappelle le siège de Québec en 1690, un castor s'avance vers une femme assise sur des trophées enlevés à l'ennemi: la France et le Canada. Cela est-il suffisant pour affirmer que l'intention du Souverain était d'imposer le castor comme signe héraldique de la colonie, mais, alors pourquoi ne le retrouve-t-on nulle part sous le régime français? Louis XIV en 1690, Frontenac en 1673 songeaient aux belles pelleteries, non pas à autre choses.

La monnaie destinée aux colonies françaises, ce qui comprend la Louisiane et les Antilles avec le Canada, sous Louis XV, en 1721, ne répète pas la devise de 1670, cela se conçoit. Elle ne nous dit rien de nouveau avec ses trois fleurs de lys, et pas de castor.

Sur la page du titre de l'*Histoire de la Nouvelle-France* de Charlevoix, publiée en 1744, on voit une vignette représentant une ruche d'abeilles et deux castors sous des branches d'arbres. Il a plu à l'éditeur d'en agir ainsi. On aurait tort d'attribuer la moindre valeur à ce dessin.

Une petite médaille de 1754 qui a rapport à Québec, montre deux castors qui se combattent sur un tronc d'arbre, symbolisant la lutte entre Anglais et Français au sujet du commerce des pelleteries. La guerre de Sept Ans commençait, comme celles qui l'avaient précédées, toujours à cause des peaux de castor, mais cela ne veut pas dire que le castor représentait officiellement le Canada, pas plus que, sur cette même médaille il représentait les colonies anglaises d'après l'autorité.

La médaille frappée en Angleterre pour commémorer la conquête du Canada, année 1760, porte une femme explorée (la France) et un castor bien en évidence, comme pour dire: "Voici la réponse à l'orgueilleuse médaille de 1690," ou encore: "Vous avez perdu le pays des fourrures," mais c'est une simple allégorie, privée de toute déclai-

ration de la couronne disant que le castor appartient aux armes du Canada. L'écusson même de cette colonie n'existait pas.

On m'a parlé d'une médaille française de 1764 qui montre un castor sur l'une de ses faces. En 1764! cela ne vaut rien.

La médaille du Congrès de Philadelphie rappelant le souvenir de l'invasion de 1775 exhibe l'inévitable castor. Franklin plaça aussi un castor sur la monnaie de carton de ce Congrès, mais l'exemple n'a pas été suivie.

"Le Beaver Club" de Montréal frappa une médaille, en 1785 et cette société de marchands de fourrures ne manqua point d'y mettre un castor.

Dans une étampe fastueuse, en tête de la *Gazette de Montréal* de Fleury Mesplet, en 1788, il y a un castor.

Le général Sir Guy Carleton devenant Lord Dorchester fut autorisé à peindre un castor dans ses armes, comme autrefois Sir William Alexander.

Une institution financière qui s'appelait *Canada Bank* émettait des billets dont l'un portait la figure d'un castor dessinée au pied d'un arbre qu'il rongait.

The Loyal and Patriotic Society of Upper Canada, formée durant la guerre de 1812, imprima, à Montréal, chez William Gray, en 1817, une brochure dans laquelle on proposait de donner des médailles à certaines personnes méritantes et de mettre sur le revers un castor emblématique de l'industrie.

Le sou de la compagnie du Nord-Ouest, 1820, porte un castor. Cette compagnie n'existait que pour le trafic des pelleteries.

Vers 1830, M. Jacques Viger mit le castor dans l'écusson de la ville de Montréal. La ville n'est pas la nation.

Il est impossible de trouver une autorité législative qui proclame le castor emblème du Canada. Le grand sceau de notre confédération n'a point de castor.

Quant à la monnaie actuelle et aux timbres-postes qui portent le castor, cela est sans conséquence. Ces figures changent comme la mode.

Les Canadiens de 1834 ont été les premiers à choisir le castor comme signe de nationalité. Ils avaient déjà la feuille d'érable. Trente ou quarante ans plus tard, les Anglais, les Écossais, les Irlandais les ont imité sur ces deux points—et en même temps, ils ont commencé à se dire Canadiens. Jusque vers 1870 il n'y avait de *Canadiens* que les découvreurs et fondateurs du pays. Depuis quarante ans, il a fallu créer pour ceux-ci le nom de Canadiens-Français, ce qui m'a fort étonné dans les commencements.

IX.

Le cimetière de Notre-Dame-des-Neiges de Montréal, ouvert en 1855, reçut son premier monument au mois de juin de cette année et l'inauguration de celui-ci eut lieu en octobre suivant. Le 21, on transporta les restes de Duvernay à cet endroit, sous une pyramide en pierre de taille de trente pieds de haut avec une base carrée de sept pieds. La translation donna lieu à une sortie de presque tous les citoyens de Montréal, avec une pompe religieuse et civile extraordinaire.

C'était vingt et un ans après la première réunion de la Société Saint-Jean-Baptiste et déjà toute la province était remplie de cette institution. La presse parla longuement de ces grandes funérailles, et disons aussi que, en 1852, la mort du fondateur avait inspiré de nombreux articles qui faisaient voir l'étendue des regrets du peuple et la situation de cette société nationale.

Monsieur George-Etienne Cartier prononça le discours principal devant la colonne commémorative: "En déposant sous ce monument, à l'ombre des érables, les cendres de Ludger Duvernay, nous accomplissons un devoir commandé par le mérite et la vertu aussi bien que par le sentiment de la reconnaissance. Permettez-moi de saisir cette occasion pour faire quelques remarques sur notre association et son avenir.

"En la fondant, Ludger Duvernay n'a pas voulu que son œuvre finit avec lui. Son vœu le plus ardent était qu'elle lui survécût comme moyen d'aider les Canadiens-français à maintenir leur existence nationale en Canada. Nous serions indignes de notre nom, et nous ferions défaut aux vœux et aux désirs du regretté fondateur de notre association, si nous n'unissions tous nos efforts pour assurer la permanence de notre nationalité.

"Le travail et la bonne conduite de chaque membre d'une société constituent une base solide et sont deux nécessaires et efficaces moyens de succès pour l'être national dont il fait partie. Mais il ne suffit pas pour les membres d'une nationalité d'avoir contribué à son existence par leur travail et leur bonne conduite et de l'avoir mise en voie de progrès. Il leur reste encore une grande œuvre à accomplir. Il leur reste à en assurer la permanence. Il n'est pas nécessaire que j'indique le moyen d'obtenir cette permanence—vous le connaissez comme moi—la raison de chacun de nous, l'histoire et l'expérience de toutes les nationalités, et surtout notre propre histoire, nous le font voir suffisamment.

"Comprenons bien que l'élément personnel ne constitue pas seul une nationalité; il faut en outre l'élément territorial. La race, la

langue, l'éducation et les mœurs d'un peuple forment ce que j'appelle un élément personnel national. Mais cet élément devra périr s'il n'est pas accompagné de l'élément territorial. L'expérience démontre que pour le maintien et la permanence de toute nationalité il faut l'union intime et indissoluble de l'individu avec le sol. Canadiens-français, n'oublions pas que si nous voulons assurer la permanence de notre existence nationale, il faut nous cramponner au sol de notre patrie. Il faut que chacun de nous fasse tout en son pouvoir pour conserver son patrimoine. Celui qui n'en a point doit employer le fruit de son travail et de son industrie à l'acquisition d'une partie de notre beau sol, quelque minime qu'elle soit, car il faut laisser à nos enfants et descendants, non-seulement le sang et la langue de nos ancêtres, mais encore la propriété du sol natal. Si, plus tard, des tentatives hostiles sont faites contre notre nationalité, quelle force et quelle vigueur le Canadien-français ne trouvera-t-il pas pour la lutte dans l'union entre sa personne et le sol!

"Il y a un siècle, nous étions à peine soixante mille Canadiens-français, disséminés sur les rives de notre beau Saint-Laurent, et aujourd'hui, nous sommes au-delà de 600,000, propriétaires au moins des trois quarts du sol en culture du Bas-Canada. Si notre être national trouve aujourd'hui de la vitalité dans notre nombre et dans notre élément personnel, notre élément territorial en garantit la permanence.

"Je ne vois pas d'éventualités possibles qui puissent donner le coup de mort à notre nationalité, aussi longtemps que nous aurons, par le droit et titre de propriétaires, racine dans le sol de nos pères. Compatriotes, souvenons-nous donc toujours que notre nationalité ne peut se maintenir qu'à la condition de demeurer propriétaires dans notre beau pays.

"Jetez en ce moment les yeux sur l'Irlande. Voyez l'heureux changement qui s'opère dans l'intérêt de la nationalité irlandaise en butte depuis tant d'années au malheur et aux difficultés de tout genre. Jusqu'à ces dernières années, l'Irlande a été soumise à un système de lois sur la propriété, qui en rendait pour ainsi dire l'accès impossible à ses malheureux enfants. L'Irlandais se trouvait jusqu'à un certain point séparé du sol natal qu'il occupait à la surface, il est vrai, mais dans le sein duquel il ne pouvait prendre racine à titre de propriétaire. Aussi s'est-il vu obligé d'émigrer loin de sa chère Irlande pour trouver ailleurs une portion du sol qu'il put dire être la sienne. Ce triste sort fait au pauvre Irlandais de se trouver pour ainsi dire dans l'incapacité d'acquérir quelque portion du sol de son Irlande, a été le plus rude coup porté à sa nationalité. Mais quel heureux changement ne voyons-nous pas se réaliser maintenant pour lui en Irlande? La

loi dite—*the law of incumbered estate*,—qui autorise la vente en lots de 50 à 200 acres, d'immenses territoires possédés jusqu'alors par de grands propriétaires qui n'en tiraient de profits ni pour eux ni pour leurs tenanciers, n'est en opération que depuis quelques années, et voilà que déjà des millions d'acres ont été vendus en petits lots à des propriétaires irlandais. Certains maintenant d'y devenir propriétaire, un grand nombre de fils émigrés de l'Irlande reprennent déjà la route de leur patrie. L'Irlande est donc en voie d'unir sa personne à son sol natal, par le lien de la propriété, et de redonner par là de la vigueur et de la permanence à sa nationalité.

“Jetez les yeux sur la France, cette chère patrie de nos ancêtres. Pourquoi y voyons-nous l'esprit national aussi fort et aussi vigoureux! C'est parce que le Français est uni par la propriété au sol qu'il habite. Un écrivain, dans un moment de délire et d'insanité, a osé proclamer que “la propriété est un vol” Maxime blasphématoire et délétère, maxime destructive du travail et de toute nationalité! En effet, le travail existerait-il s'il n'avait la propriété pour but et pour rémunération! Et sans la propriété pourrait-il exister une nationalité et une patrie?

“Remarquons que la même nécessité de tenir au sol à titre de propriétaire pour le maintien de notre nationalité, existe également pour les membres de nos sœurs-sociétés nationales. La lutte qui doit se livrer entre nous et les membres de ces sociétés sœurs de la nôtre, pour la possession du sol, doit être une lutte de travail, d'économie, d'industrie, d'intelligence et de bonne conduite, et non pas une lutte de race, de préjugés et d'envie. Le Canada a de l'étendue; il y a de l'espace pour eux, pour nous et des millions encore.

“Les deux principales races qui habitent le Canada ont pour ancêtres les ancêtres des deux grandes nations européennes qui luttent de concert aujourd'hui¹ pour empêcher une nationalité affaiblie de succomber sous la tyrannie et sous la brutalité absorbante d'une nationalité plus forte. Comment, nous qui réclamons les mêmes ancêtres que ceux des deux grandes nations dont les armées libératrices combattent ensemble si noblement et si glorieusement pour le soutien du plus faible contre l'oppression du plus fort, pourrions-nous ne pas vivre en harmonie sur le même sol?

“Dans la lutte de travail et d'industrie que nous savons à soutenir avec les membres de nos sœurs-sociétés nationales, souvenons-nous que, comme le majestueux érable dont la feuille fait partie de notre blason national est le premier parmi les arbres de la forêt et croît toujours sur le meilleur sol, les Canadiens-français doivent prendre racine sur la plus fertile et le plus avantageux! C'est ainsi que nous

¹ Guerre de Crimée. Et la guerre de 1914-1916 qui n'est pas finie!

hâterons le développement et la prospérité de la nationalité à laquelle nous appartenons. L'érable dont la feuille orne la poitrine des Canadiens-français au jour de notre fête nationale comme elle ombrage la tombe de nos frères décédés, doit croître sur un sol qui soit le nôtre. Fasse le ciel que jamais n'arrive le jour où le Canadien-français aura cessé d'en être le propriétaire, car, de ce moment, finira notre nationalité.

"Réunis en ce moment près de la tombe du fondateur de notre association nationale, prenons l'engagement solennel de travailler pour le maintien de nos institutions et de lutter ensemble d'industrie, d'intelligence et de bonne conduite pour nous soutenir et nous étendre comme propriétaires dans notre belle patrie. En faisant et en accomplissant cette promesse nous remplirons les vœux du courageux patriote dont nous déplorons aujourd'hui la perte.

"Avant de nous séparer, livrons-nous un moment au sentiment de la reconnaissance pour la mémoire du défunt qui, par la fondation de la Société Saint-Jean-Baptiste, a si puissamment contribué au développement de notre nationalité en donnant l'essor à l'esprit d'association parmi nous.

"Il ne me reste plus qu'un devoir à accomplir, c'est de rendre, au nom de la Société Saint-Jean-Baptiste, un tribut de gratitude bien mérité aux membres du clergé, aux autorités civiles, aux sociétés littéraires, religieuses et de tempérance, aux professeurs et élèves de nos maisons d'éducation, aux officiers de la milice et de la cavalerie canadienne, aux membres de la presse, aux compagnies de pompiers et aux corps de musique, pour le généreux concours qu'ils ont bien voulu nous prêter dans cette circonstance mémorable.

"En terminant, messieurs, permettez-moi d'exprimer les sentiments que j'éprouve au pied du mausolée que la reconnaissance de tout un peuple élève à la mémoire de Ludger Duvernay, et à côté duquel nous viendrons tous successivement nous reposer¹ au terme de notre vie, et de vous dire que, forcés de résider loin de vous durant quelques années peut-être en raison du service public, je n'en continuerai pas moins de combattre de toute la force de mon patriotisme pour les droits et les intérêts de notre association, à la grandeur et à la prospérité de laquelle le fondateur de la Société Saint-Jean-Baptiste a consacré chaque heure de sa vie.²

¹ Sir George-Étienne Cartier a été inhumé, en 1873, non loin de Duvernay. L'année prochaine aura lieu l'inauguration d'un monument à sa mémoire.

² Ce morceau est emprunté au journal *Le Canadien*, de 1855. Il a été reproduit dans *Le Pays Laurentien* de janvier 1916. On le trouve, avec quelques différences, dans le volume des *Discours* de Sir George-Étienne Cartier publié en 1893 par Joseph Tassé.

X.

La célébration annuelle de la Saint-Jean-Baptiste n'a pas fait que grandir depuis quatre-vingts ans, elle a produit d'immenses résultats car les Canadiens y puisent de plus en plus l'amour de la patrie, la connaissance de leur histoire déjà ancienne et toujours honorable, souvent glorieuse. Les livres n'atteignent pas tous les rangs ou degrés d'un peuple, il faut, pour compléter l'enseignement, quelque chose qui parle aux yeux, qui retentisse aux oreilles, qui réchauffe les esprits. La parade du 24 juin c'est une secousse, une sorte de commotion qui réveille les endormis, ranime les faibles, redouble le courage des forts et prend une large place dans l'éducation nationale. Pas de Saint-Jean-Baptiste, ce serait presque vivre dans l'oubli d'un noble passé et l'indifférence du présent—il s'en suivrait l'abandon de ce qui nous caractérise en ce monde. Les nationalités proviennent d'une volonté divine, ne perdons pas de vue ce fait de toute importance. Une fête nationale nous est nécessaire. Il y a cent ans on le comprenait, on le désirait, sans trop savoir comment y arriver. Des tentatives étaient faites qui ne réussissaient guère; la politique en inspira le moyen; le projet nouveau, sitôt connu, fit le tour du pays comme une traînée de poudre.

Enfin, Duvernay vint! Son instinct admirable
Enrôla la Saint-Jean sous la feuille d'érable.
L'industriel castor tressaillit dans les bois.
De clocher en clocher chanta le coq gaulois:
"Nos institutions, notre langue et nos lois."

B. SULTE.



Un chapitre d'histoire contemporaine—Le cardinal Satolli.

Par MGR LOUIS-AD. PAQUET, M.S.R.C.

(Lu à la réunion de mai, 1916)

Le progrès intellectuel n'est ni complet ni sûr, s'il ne se fonde sur de solides connaissances philosophiques et théologiques. Remarquables ont été, pendant le siècle dernier, l'avancement des sciences de la nature et l'essor imprimé aux recherches de l'histoire. Dieu a voulu que, parallèlement à ces études, et pour leur prêter un appui nécessaire, la science souveraine, celle qui s'occupe de Dieu et des rapports de l'homme avec Dieu, fût l'objet d'une rénovation profonde et d'une véritable renaissance.

Nous voulons parler du mouvement thomiste et néoscolastique commencé sous Pie IX, mais auquel Léon XIII, par la puissance de son génie et de son action, sut donner une impulsion vigoureuse et décisive.

C'est en Italie que l'élan régénérateur s'est d'abord produit. L'Italie est la terre classique des doctrines orthodoxes. On y cultive la science moins peut-être dans ses applications diverses et ses réalisations pratiques que dans ses principes ultimes et ses sources les plus cachées. L'Espagne, l'Allemagne, la France, ont aussi apporté à l'œuvre restauratrice de l'antique savoir de très importantes contributions. La Belgique, par la fondation de son institut supérieur de philosophie, et par la plume du plus célèbre de ses philosophes devenu depuis l'éminentissime cardinal Mercier, s'est conquis une place d'honneur dans l'histoire de la pensée moderne.

Pourquoi n'ajouterais-je pas que le Canada, de son côté, mérite à cet égard une mention spéciale, et que l'Université Laval est, de nos jours, l'un des premiers foyers où se soit allumé le flambeau de saint Thomas, et l'une des institutions qui ont, suivi avec le plus de constance les enseignements du moine d'Aquin ?²

Or, de tels résultats ne peuvent se réaliser, et de pareils mouvements ne peuvent atteindre et influencer une large portion de l'humanité pensante, sans le concours d'esprits actifs et d'initiateurs trans-

¹ À propos du cardinal Mercier, voir le *Correspondant* (10 fév. 1916).

² Cf. abbé Robert, *Histoire de la Philosophie*, pp. 391-392. La *Catholic Encyclopedia*, en résumant (vol. X, pp. 748-749) l'histoire du mouvement néothomiste, eût pu, sans manquer à la vérité, faire une place dans cette synthèse au Canada et à l'Université Laval.

cependants. François Satolli, tour à tour professeur et recteur d'académie, puis délégué papal et membre du Sacré Collège, fut l'un des plus compétents et des plus énergiques ouvriers de la réaction thomiste. Nous avons eu l'honneur de le connaître et de nous asseoir à son école. Et nous voudrions, autant par souci de justice que par motif de gratitude, faire revivre en quelques pages modestes cette grande figure, qui fut celle d'un métaphysicien très profond, et d'un théologien très éminent, plus encore que d'un homme d'action, de gouvernement et de conseil.

I

LE PHILOSOPHE

François Satolli naquit le 21 juillet 1839, à Marsciano, dans le diocèse de Pérouse, de parents issus d'une souche patricienne. Par un providentiel dessein, ses yeux virent donc le jour sous le ciel enchanteur de l'Ombrie, dans cette douce et pure lumière qui baigne l'âme de clartés sereines, et qui provoque chez elle les conceptions sublimes et l'ascension vers les hauteurs.

Etudiant au séminaire de Pérouse, il eut pour professeur de lettres son propre frère, humaniste délicat et prédicateur fameux. De cette influence, et de cette heureuse formation littéraire, l'illustre scolastique ombrien garda toujours des traces. Très souvent, dans ses leçons même les plus abstraites, la poésie et l'éloquence prêtèrent au vol subtil de la métaphysique l'aide la plus précieuse. Il avait une très haute estime pour Dante Alighieri, le grand poète théologien, qu'il se plaisait à citer, de même qu'il professait l'admiration la plus vive pour le prince des orateurs chrétiens de la France, l'incomparable Bossuet.¹

Toutefois cette intelligence, si remarquable à tous égards, semblait plutôt faite pour les sciences. Elle s'attachait avec ardeur aux problèmes mathématiques et aux questions philosophiques. Vers la fin de son cours, le jeune Satolli soutint publiquement, et avec le plus vif succès, une thèse en géométrie analytique. C'était l'indice très sûr d'un esprit aussi pénétrant que solide. Les raisonnements les plus profonds n'avaient pour lui aucun secret. La philosophie lui était enseignée par un tenant fidèle et un admirateur passionné de saint Thomas d'Aquin, Joseph Pecci, frère de l'archevêque de Pérouse et du futur Léon XIII. Sous l'autorité d'un tel maître, l'élève conçut lui-même pour les doctrines thomistes, et pour la forte dis-

¹ Voulant marquer un jour que, si l'Italie l'emporte sur la France par ses théologiens, la France l'emporte sur l'Italie par ses orateurs, il nous disait: "Nous avons, nous, un Thomas d'Aquin, mais nous n'avons pas de Bossuet."

cipline scolastique incarnée dans l'Ange de l'école, un amour sans cesse grandissant.

Ordonné prêtre par le cardinal Pecci en 1862, l'abbé Satolli consacra ses premières années sacerdotales à l'enseignement des lettres, puis à celui de la philosophie, dans le séminaire de Pérouse. Il enseigna aussi quelque temps à la célèbre abbaye bénédictine du mont Cassin. Son âme d'apôtre le portait en même temps vers les fonctions du saint ministère qu'il exerça dans son diocèse, soit par la parole sacrée, soit par le gouvernement de deux importantes paroisses.

Ses loisirs ne restaient pas inoccupés; et c'est à la restauration déjà commencée des sciences et des études philosophiques qu'il les employait. Une académie de Saint-Thomas avait été fondée à Pérouse par les soins de l'éminentissime archevêque. L'abbé Satolli s'en montra dès le début l'un des membres les plus actifs, et il en devint dans la suite le très zélé directeur. L'académie avait pour but, dans des conférences et des discussions qui avaient lieu chaque mois, de tirer de l'oubli les doctrines admirables du premier des philosophes, et d'en faire voir l'adaptation merveilleuse aux besoins et aux problèmes de l'âge moderne.

C'est dans ce dessein que l'abbé Satolli composa un manuel de Logique (imprimé seulement en 1884), et qu'il fit paraître une série de brochures philosophiques du plus haut intérêt.¹

L'idée mère de ces opuscules, c'est que la philosophie moderne encombrée de systèmes incohérents et novateurs, a jeté les esprits dans un immense désarroi, et qu'il faut hâter le jour où la philosophie de saint Thomas, mise en accord avec les sciences expérimentales, dégagera celles-ci du matérialisme grossier qui les dépare, et se parera elle-même d'un nouveau lustre.

Pour obtenir ce résultat, rien ne semble plus utile ni plus urgent qu'un bon cours de philosophie, propre à former et à discipliner selon les exigences actuelles l'esprit de la jeunesse. Et l'auteur s'applique, dans l'une de ses brochures, à montrer comment pareil ouvrage doit être rédigé et quelles garanties il doit offrir. Profondeur logique de la pensée, et clarté méthodique de l'exposition: telles sont les qualités maîtresses que l'abbé Satolli requiert de l'enseignement philosophique et l'on peut dire de tout enseignement scientifique.— Ce vœu formulé surtout pour les doctrines scolastiques, et que déjà quelques précurseurs avaient commencé de réaliser, devait être bientôt

¹ Voici les titres de quelques-uns de ces écrits:

Studio della Filosofia in Italia (Pérouse, 1872).—*Ragionamenti accademici* (Pérouse, 1878): *Sull' Accademia di S. Tommaso ragionamento*; *Ragionamento accademico sulla scolastica comparata alla Letteratura*; *Sull' opera del Dottore Fredault* (Forma e materia) *ragionamento critico*.

comblé par l'apparition de plusieurs excellents ouvrages devenus classiques, tels ceux du cardinal Zigliara, du Père de Maria, du cardinal Lorenzelli, et, chez nous, le manuel de l'abbé Lortie.

Pour l'abbé Satolli, la philosophie n'est pas seulement le fondement nécessaire des sciences de la nature. Elle est aussi la règle profonde du juste et de l'injuste, et la loi génératrice de l'ordre social; et nous ne savons que trop, par ce qui se passe sous nos yeux, jusqu'à quel degré de perversion légale et de tyrannie administrative l'ignorance de cette loi et le mépris de cette règle peuvent incliner le sceptre de l'autorité.

Et si, sans les principes d'une saine philosophie, la société est incapable de se maintenir longtemps sur ses bases, de même sans la culture féconde des idées générales, il paraît impossible que les lettres fleurissent. Philosophie et littérature sont donc deux alliées naturelles et, pour ainsi dire, deux sœurs. C'est ce que l'abbé Satolli démontre en des pages d'une vérité saisissante; faisant voir, en outre, combien le latin de saint Thomas convient à la science qu'il expose, et prouvant par l'exemple de Dante et d'autres écrivains renommés que la scolastique, tant décriée de certains littérateurs et de certains rhéteurs, a rendu aux lettres chrétiennes, notamment en Italie, les plus signalés services.

Devenu professeur de théologie à Rome, l'abbé Satolli, bien loin de se refroidir dans le culte qu'il avait voué aux sciences philosophiques, s'y livra avec plus d'ardeur encore. Il se lia d'amitié avec l'abbé Lorenzelli, chargé du cours de philosophie à la Propagande où lui-même enseignait; et tous deux prirent une part considérable dans les travaux de l'Académie romaine de Saint-Thomas fondée vers la même époque sous les auspices de Léon XIII.

Cette société, alors présidée par les éminentissimes Pecci¹ et Zigliara, comptait parmi ses membres les maîtres les plus distingués des Universités romaines. On se réunissait chaque semaine pour exposer, interpréter et défendre les doctrines philosophiques enseignées par l'Ange de l'école. L'élite intellectuelle de Rome était là. De doctes dissertations lues à tour de rôle par les membres de l'Académie, sur les points les plus essentiels ou les plus controversés de la philosophie thomiste, dissertations très soignées, très fouillées, et d'où naissaient souvent d'intéressantes discussions, alternaient avec des soutenances dont les élèves des différents collèges faisaient les frais. Il en résultait parmi ces élèves, de dans tous les cercles d'étudiants,

¹ Joseph Pecci, frère du Pape, et ancien professeur de philosophie à Pérouse, avait été élevé au cardinalat. C'est lui qui prononça le discours d'inauguration de l'Académie romaine de Saint-Thomas, le 8 mai 1880 (cf. *L'Accademia romana di S. Tommaso d'Aquino*, Vol. I, pp. 3-85).

et même dans des sphères plus hautes, une singulière émulation. Du choc des opinions et du contact des esprits jaillissait la lumière, et ces tournois scolastiques ne contribuaient pas peu à accentuer, au foyer de la science chrétienne, le mouvement de renaissance encore à son début.¹

Dans ces compétitions du savoir, le professeur Satolli brillait au premier rang. Il s'imposait par sa parole et par ses écrits. On a de lui, entre autres travaux datant de cette époque, de pénétrants commentaires de la doctrine de saint Thomas touchant l'essence de l'âme, les facultés dont elle est ornée et le criterium qui les distingue, et concernant l'harmonie qui règne entre l'intelligence et la volonté.² L'auteur de ces études s'y révèle non seulement disciple éclairé et fidèle du maître dont il expose la pensée, mais de plus connaisseur érudit et critique compétent des systèmes très variés de la psychologie moderne.

On fait parfois aux scolastiques italiens le reproche de s'enfermer dans leurs principes comme dans une tour, et de ne pas faire état de l'opinion contemporaine. Nous ne croyons pas ce grief, pris en un sens général, suffisamment fondé.³ Pour ce qui est en particulier de l'abbé Satolli, nous savons pertinemment qu'une lecture bien réglée le tenait au courant des principales théories du jour. Ce savant, d'autre part, estimait non sans raison que l'esprit perd de sa force en s'éparpillant sur trop de choses; et que le meilleur moyen de dissiper les ténèbres de l'erreur, c'est moins de poursuivre partout et un peu à l'aveuglette des systèmes sans cesse renaissants, que d'allumer et d'entretenir au sommet de l'intelligence la flamme vivace de la vérité.

Ce principe avait guidé saint Thomas d'Aquin lui-même dans ses œuvres les plus réputées, la "Somme théologique" et la "Somme contre les Gentils." Ne nous étonnons pas que le disciple Satolli en ait fait, lui aussi, la loi ordinaire et fondamentale de sa carrière de professeur et d'écrivain.

¹ L'Académie de Saint-Thomas, tombée depuis quelques années dans une sorte de somnolence, vient d'être ravivée et ramenée aux anciennes traditions par Sa Sainteté Benoît XV.

² *Dell' essenza e delle facoltà dell' anima umana* (Rome, 1881); *Criterio delle potenze dell' anima umana* (Rome, 1882); *Armonia dell' intelletto e della volontà* (Rome, 1884).

³ Les travaux de Zigliara, de Cornoldi, de Lorenzelli, de Talamo, pour ne citer que quelques noms, attestent victorieusement le contraire.

II

LE THÉOLOGIE

C'est dès la troisième année du règne de Léon XIII que François Satolli fut appelé de Pérouse à Rome pour occuper la chaire dogmatique de la Propagande.

On nous permettra de reproduire ici ce que nous écrivions en 1892 dans une de nos revues,¹ pour apprécier l'œuvre théologique de celui qui à cette date avait dû échanger, non sans regrets, sur l'ordre du Pape, l'enseignement contre la diplomatie: "Le prélat éminent qui exerce en ce moment aux États-Unis les importantes et délicates fonctions de délégué apostolique est né à Marsciano, dans l'Ombrie, non loin de Pérouse.

"Alors que Léon XIII, avant de devenir pape, occupait le siège épiscopal de cette ville, il remarqua de bonne heure, parmi les élèves de son séminaire, ce jeune esprit, vif et ardent, dont les talents peu communs et l'empressement au travail donnaient déjà de belles espérances. L'archevêque le prit en amitié et ne cessa, depuis ce temps, de lui porter un intérêt toujours croissant.

"François Satolli brilla surtout dans les études philosophiques qu'il eut la bonne fortune de faire sous la direction d'un maître vraiment supérieur, passionné pour les doctrines de l'Ange de l'école, et qui sut infuser à son disciple le même amour pour saint Thomas: je veux parler de Joseph Pecci, frère du Pape, et créé plus tard cardinal.

"Le jeune Satolli, devenu prêtre, enseigna successivement la rhétorique et la philosophie.

"Quelques esprits d'élite, formés à l'école de l'archevêque de Pérouse et de son frère Joseph, avaient eu l'heureuse idée de mettre en commun leurs efforts et leurs travaux pour mieux approfondir les enseignements de la scolastique et du prince des philosophes, saint Thomas. Satolli fut l'âme de ce cercle. Il publia diverses brochures destinées à réveiller, dans les écoles catholiques, le culte des vieilles traditions scolastiques. Toutefois la gloire de son nom n'était encore qu'à son aurore. La Providence le préparait dans l'ombre à la haute mission qui devait bientôt lui être confiée.

"En effet, à peine Léon XIII eut-il pris les rênes du gouvernement de l'Eglise, qu'il appela près de lui l'humble prêtre pérugin pour remettre en ses mains l'enseignement dogmatique d'une des principales universités romaines, la Propagande.

¹ La *Semaine religieuse* de Montréal, alors dirigée par M. l'abbé Bruchési, devenu Mgr l'archevêque de Montréal.

“C’était en novembre 1880. Quand l’abbé Satolli parut pour la première fois dans sa chaire, son extérieur modeste, son visage basané, ses manières timides et presque embarrassées, produisirent sur l’auditoire une impression qui, sans être défavorable, cachait des doutes et des craintes. Les craintes durèrent peu; les doutes firent bientôt place à un concert d’éloge, et à une vaste explosion d’admiration et d’enthousiasme. Nous étions en présence d’un maître de la parole et d’un prince de la pensée.

“Mgr Satolli parle avec chaleur, conviction et persuasion. Il sait donner aux notions les plus sèches et les plus abstraites de la métaphysique ou de la théologie, les couleurs imagées et les formes mouvantes, souvent même éloquentes, sous lesquelles la vérité s’insinue et pénètre irrésistiblement dans les esprits. Plus son sujet s’élève, plus sa parole s’anime. Le geste, toujours expressif, devient plus ferme, plus puissant; sa figure s’illumine, ses yeux lancent des éclairs, et la thèse qu’il soutient, munie de toutes ses preuves, dégagée des ombres et des sophismes de l’erreur, apparaît dans tout son éclat.

“Humble et doux hors de l’école, c’est un athlète qui, dans le champ clos, ne craint pas, pour sauvegarder les intérêts de la vérité et pour défendre les doctrines théologiques qu’il croit les meilleures, de frapper à visière ouverte les plus forts adversaires. N’étant lié d’avance à aucun parti, il juge tous les systèmes d’après leur valeur propre; et son esprit aussi lumineux que subtil et pénétrant n’a pas peu contribué à éclaircir certaines questions demeurées jusque là mal définies ou mal comprises.

“La philosophie doit à Mgr Satolli un “manuel de Logique” calqué sur les méthodes d’Aristote et de saint Thomas. L’auteur a de plus, renouant l’ancienne tradition des grands docteurs du moyen âge, commenté dans un long ouvrage les principaux traités dogmatiques de la “Somme théologique.” Et c’est ici surtout que se révèle dans toute sa force la haute intelligence de l’illustre docteur pérugin. Le cadre restreint de cet article ne nous permet pas d’analyser, même sommairement, les “Commentaires de la Somme.” Nous dirons seulement que cette œuvre magistrale, où l’on peut suivre pas à pas la marche de l’Ange de l’école, restera comme l’un des plus beaux monuments de la restauration intellectuelle entreprise et poursuivie avec tant de succès par Sa Sainteté Léon XIII.”

Revenons vers les débuts de cette restauration et vers le théologien chargé par le Souverain Pontife lui-même d’inaugurer à la Propagande l’enseignement de la Somme théologique, lequel ne se donnait plus guère que dans l’enceinte des écoles dominicaines.

Ce n’était certes pas une tâche facile que de ramener dans certaines chaires universitaires du dix-neuvième siècle, pour en faire le

texte des leçons de chaque jour, les écrits d'un moine du moyen âge. La manière de penser d'esprits éminents formés sous d'autres maîtres, et d'après d'autres méthodes, opposait à ce mouvement des obstacles qui eussent pu décourager une âme moins ferme que celle de François Satolli, et une autorité moins résolue que celle du pape Léon XIII.

Ce nouveau professeur ne négligea rien pour intéresser non seulement les élèves, mais les supérieurs eux-mêmes, à la réforme dogmatique entreprise. Dès les premiers mois, des discussions publiques furent organisées. Les plus hautes autorités de la Propagande y étaient conviées; et pour agrémenter ces séances et ces débats didactiques de formes moins sévères, le maître en Saint-Thomas se faisait volontiers poète et contraignait les Muses à célébrer les gloires de l'Ecole. Ces soutenance, d'abord très restreintes, virent peu à peu leurs cadres s'élargir; et il vint un jour où elles osèrent franchir le seuil auguste du Vatican et se produire devant la personne même du Pape.

Elles étaient tout à la fois un élément de progrès et une preuve de succès. L'idée léonienne triomphait.

D'ailleurs, la restauration thomiste arrivait à point.

Une grave question agita alors les esprits dans toute l'Italie et même en d'autres pays: la question rosminienne. Le rosminianisme portait un coup funeste à la philosophie et à la théologie traditionnelles qu'il atteignait dans leurs principes mêmes et qu'il révolutionnait dans les conclusions les plus universellement reçues. Le professeur Satolli, sans jamais écarter de son programme l'exposition claire, ordonnée, et intégrale des doctrines de saint Thomas, faisait fréquemment de ces doctrines une application directe aux erreurs courantes. Et on peut dire qu'il fut, dans la lutte menée avec vigueur et finalement victorieuse, contre le système rosminien, l'un des chefs les plus clairvoyants en même temps que l'un des soldats les plus redoutés.

Les échos de cette lutte, comme aussi ceux d'autres querelles d'école, retentissent à travers toutes les pages consacrées, en cinq forts volumes,¹ par l'abbé Satolli à commenter la somme de saint Thomas.

L'auteur de ce commentaire excelle à faire la lumière sur les pensées les plus profondes, et souvent les plus incomprises, du texte. Il y a dans saint Thomas des mots et des formules riches comme des filons d'or. Heureuse la main qui sait ouvrir ces filons et exploiter ces richesses! Nous ne croyons pas nous tromper en disant que,

¹ *Praelectiones in Summam theologicam D. Thomæ Aquinatis*. Ces volumes, parus à Rome de 1884 à 1888, traitent de Dieu, de la Trinité, des opérations divines, de la grâce, de l'incarnation. Ils furent honorés d'un Bref Papal très élogieux.

sur plusieurs points d'importance majeure, le professeur Satolli a enrichi la science du dogme d'aperçus très justes et de clartés révélatrices. Tels passages de ses livres brillent comme des phares, et projettent sur d'obscures matières les éclaircissements les plus précieux. Sa parole est trempée comme l'acier, et il s'en échappe par intermittence les plus vifs reflets.

Nous disons "par intermittence." Car si le cours parlé de l'abbé Satolli était toujours très clair, tissé d'exemples et d'images propres à faire transparaître les vérités les plus abstruses, par contre ses leçons écrites, rédigées en un style concis et souvent avec une structure de phrases solide et vigoureuse sans doute, mais complexe et heurtée, offrent par cela même des difficultés sérieuses. Le commentateur s'éloigne trop alors de la simplicité de la "Somme," et ne s'applique pas assez à corriger la forme énigmatique des remarques très subtiles de Cajetan dont il s'inspire, et qu'il reproduit çà et là sans les retoucher. Voilà pourquoi l'œuvre dogmatique de Mgr Satolli ne sera jamais justement appréciée que d'un petit nombre de lecteurs. Ceux du moins qui auront le courage de rompre la noix, goûteront salutairement le fruit.

Deux ouvrages juridiques publiés par le même écrivain, l'un sur les principes du droit chrétien et les concordats,¹ l'autre sur l'histoire du droit public ecclésiastique,² se présentent en une langue moins rude, et peuvent être d'un usage plus général. Le traité des concordats en particulier est d'une grande valeur: dans un raccourci très substantiel et très méthodique, il met sous les yeux du lecteur une analyse complète des matières qui forment l'objet des diverses conventions conclues au cours des âges entre les chefs d'États et le Saint-Siège.

Nommé successivement recteur du Collège grec, puis Prélat domestique, puis président de l'Académie des nobles ecclésiastiques où se forment les futurs chargés d'affaires de la puissance papale, Mgr Satolli, soit par des écrits, soit par des conférences sur le droit, s'initiait sans le savoir à la haute et grave mission qu'il allait bientôt être appelé à remplir sur notre terre d'Amérique.

III

L'AMBASSADEUR DU PAPE

Le président de l'Académie des Nobles venait de recevoir la consécration épiscopale et, avec elle, le titre d'archevêque de Lépante.³

¹ *Prima principia juris publici ecclesiastici: De concordatis.*

² *De jure publico ecclesiastico disceptationes historico-juridicæ.*

³ En l'année 1888.

L'année suivante (1889), il fut choisi par le Souverain Pontife pour aller représenter Sa Sainteté aux fêtes du Centenaire de l'établissement de la hiérarchie américaine, et à celles de l'inauguration de l'université catholique de Washington. L'envoyé de Léon XIII prononça en cette occasion, à l'Université, un discours fort remarquable, et empreint de cette éloquence élevée et vibrante qu'il savait porter sur tous les théâtres et devant tous les auditoires.

Léon XIII avait-il fait ce choix pour préparer les voies à son futur délégué apostolique? Tout nous porte à le croire. Trois ans après, en effet, lors de l'exposition universelle de Chicago, Mgr Satolli était chargé par le Pape d'aller exprimer au gouvernement des États-Unis les sentiments d'estime et de bienveillance du Saint-Siège. Puis, quelques mois plus tard, le commissaire papal fixait sa résidence à Washington en qualité de premier titulaire d'une délégation apostolique permanente dans la République américaine.

L'importance de pareilles fonctions ne saurait échapper à personne. Elles mettent celui qui les exerce en relations nécessaires avec les chefs religieux et tout le clergé, et aussi, en maintes circonstances, avec les chefs civils eux-mêmes. Elles exigent donc de solides qualités et de réelles aptitudes. N'est pas diplomate le premier faiseur venu.

D'après le vrai sens du mot, la diplomatie est tout ensemble un art et une science. Et, puisqu'il s'agit ici de diplomatie ecclésiastique, celle-ci pourrait très bien se définir la science de la théologie et du droit chrétien habilement mise en action. C'est dire qu'elle suppose une connaissance pleine et juste de l'essence et des pouvoirs juridiques de l'Eglise, en même temps que la prudence et la fermeté suffisantes pour défendre efficacement toutes les causes et les libertés sacrées. Étrangère aux soucis de la vanité et aux calculs de l'intérêt propre, elle vise le bien commun et l'intérêt public; et, dans la poursuite d'un but si noble, elle méprise les viles méthodes des soi-disant psychologues qui font consister l'habileté diplomatique dans l'art de mentir avec audace, de flagorner avec adresse, d'exploiter en les flattant les instincts les moins avouables de la nature humaine, les jalousies, les animosités et les rancunes. Ces hommes usurpent un nom qui n'est pas le leur. Ce n'est pas diplomates, mais comédiens qu'il faut les appeler; et cette psychologie tortueuse et vaine n'a, Dieu merci, rien de commun avec la diplomatie véritable.

Tous ceux qui ont connu Mgr Satolli conviendront que ce prélat possédait au plus haut degré, avec le zèle prudent d'une âme droite et franche, la science théologique et juridique requise chez un ambassadeur de la première puissance du monde. Ses études préalables faites sur le droit social l'avaient particulièrement préparé au rôle

qu'on lui confiait. Et les discours très variés qu'il prononça pendant son séjour aux États-Unis,¹ attestent chez lui, en même temps qu'une forte culture historique et littéraire, les préoccupations les plus dignes d'un envoyé du Saint-Siège et le sens le plus aigu des réalités modernes.

Pour bien juger le premier délégué apostolique américain, il faut lire et analyser ces allocutions. Elles touchent aux plus graves problèmes religieux et nationaux. L'orateur voit dans les États fédérés où toutes les croyances et toutes les incroyances se croisent, un immense champ d'action pour l'Eglise; et il ne perd aucune occasion d'y jeter, soit en son nom, soit au nom de l'autorité qu'il représente, la semence du vrai et du bien. La Papauté et ses gloires, le catholicisme et ses bienfaits, l'intérêt que le pape Léon XIII porte à l'Eglise et à la société américaines, le respect du Saint-Siège pour les pouvoirs établis et les chartes nationales, l'indépendance du pouvoir religieux vis-à-vis des partis et des formes politiques, l'utilité d'une entente sincère et bienveillante entre l'Eglise et l'Etat, la nécessité d'un juste équilibre entre l'autorité et la liberté, voilà quelques-unes des pensées maîtresses qui forment le thème des discours de Mgr Satolli.

Le délégué ne se fait pas illusion sur les dangers qui menacent cette société nouvelle, d'une croissance si rapide, d'une activité si merveilleuse, et qui, très jeune encore, a pu atteindre un degré de puissance où n'arriva qu'après sept siècles l'antique république romaine. Et sans dissimuler son admiration pour tant d'œuvres accomplies, tant de progrès en marche, tant d'efforts voués à l'instruction de la jeunesse, il prend soin de mettre ses auditeurs en garde contre "le grand péril de notre siècle,"² le naturalisme, et il demande que l'on remédie à ce mal par le surnaturel dans les sciences et dans la vie. Il déclare que la gloire des nations ne repose pas uniquement sur la prospérité matérielle, et il rappelle cette judicieuse sentence d'Aristote que la force nationale résulte du concours de trois éléments, de l'élément religieux, de l'élément civil et de l'élément militaire.³ Par dessus tout, il insiste sur le rôle de l'éducation chrétienne telle que voulue par les Conciles et les plus hautes autorités ecclésiastiques, et sans laquelle l'instruction profane, même la plus brillante, même la plus complète, reste cependant incomplète et devient facilement dangereuse. Il revient à diverses reprises sur ce très vital sujet: nécessité, à l'école, non seulement de former l'esprit, mais de discipliner la volonté et de moraliser le cœur par l'influence de la

¹ Ces discours ont été recueillis et mis en volume, par le très révérend J.-E. Slattery, sous le titre: *Loyalty to Church and State*.

² *Ouv. cit.*, p. 264.

³ *Ibid.*, pp. 193-194.

vraie religion, seule base assurée de la morale.¹ Il proclame cette nécessité jusque dans l'enceinte des écoles publiques où on l'invite à parler. Il fait l'éloge de l'éducation donnée par les fils du Bienheureux de la Salle. Et il adjure les jeunes gens sortis de l'école catholique, de ne jamais rougir de leur foi, mais de montrer partout, en matière religieuse, la résistance et l'inaltérabilité du diamant.²

Nous ne pouvons entrer ici dans les détails de l'ardente controverse scolaire suscitée autour du nom de Mgr Satolli dès l'arrivée de ce prélat comme envoyé papal, en 1892, aux États-Unis.

On était au lendemain des discussions et des récriminations provoquées par ce qu'on a appelé le "plan de Faribault." Ce plan, dont Mgr Ireland, l'archevêque de Saint-Paul, s'était fait le protagoniste, consistait en un arrangement par lequel deux écoles paroissiales importantes, l'école de Faribault d'abord, puis celle de Stillwater, étaient livrées, moyennant certaines conditions secondaires et extrinsèques, à la direction souveraine et neutre du Bureau des écoles publiques.³ Plusieurs ayant soupçonné dans ce mode d'agir un dessein général de sécularisation, contrairement aux Conciles de Baltimore, des écoles paroissiales catholiques, la question fut portée à Rome et jugée par le Saint-Siège. Celui-ci, tout en maintenant fermement les décrets des Conciles, déclarait qu'en raison de circonstances spéciales l'arrangement Faribault "pouvait être toléré." De ce moment la discussion se porta sur le sens exact de cette décision; et c'est alors que Mgr Satolli, à la demande du Pape, formula devant les archevêques américains un certain nombre de propositions destinées à clore le débat. Ces propositions, par indiscretion ou par abus de confiance, tombèrent dans la presse avant d'avoir été examinées par les archevêques et de recevoir d'eux et du délégué une rédaction définitive. Elles donnèrent lieu à de nouveaux débats, lesquels ne purent s'apaiser que par l'intervention directe et personnelle de Léon XIII.

Le texte, même original, des propositions de Mgr Satolli maintenait d'une façon générale les décrets des Conciles de Baltimore sur les écoles paroissiales, et fermait la porte à la généralisation du nouveau système adopté par l'archevêque de Saint-Paul. Il reconnaissait le danger des écoles publiques américaines pour la foi et pour les mœurs, et la nécessité de remédier par des mesures opportunes à ce péril. Sur quelques points, toutefois, ce texte, préparé en vue d'une situation spéciale, et non avec l'intention d'exposer théoriquement et dans tous ses principes la doctrine scolaire de l'Eglise, pou-

¹ *Ibid.*, çà et là, en particulier p. 46.

² *Ibid.*, pp. 55-56.

³ Cf. Tardivel, *La situation religieuse aux États-Unis*, pp. 171-172.

vait paraître insuffisant ou équivoque, et il fit naître en effet des interprétations absolument étrangères à la pensée du Délégué et que le Souverain Pontife lui-même se vit obligé de redresser.¹

Mgr Satolli, dans ses discours, et même par des conférences philosophiques et théologiques de la plus haute portée, se fit pendant tout le temps de sa délégation l'apôtre très zélé de l'éducation catholique à tous les degrés. Il admirait l'esprit d'association des Américains, et il exhorta plus d'une fois les catholiques des États-Unis à puiser dans cette union féconde des pensées et des volontés qui s'appelle cercles d'études, sociétés littéraires, congrès, la force et l'influence pour le bien que d'autres y trouvent malheureusement pour le mal.

Les questions de la conversion des non-catholiques, de la race noire, des nationalités, de la tempérance, de la presse, des sociétés secrètes, sollicitèrent tour à tour son attention.

Témoin des immenses pertes subies par la religion aux États-Unis, Mgr Satolli demandait aux missionnaires de l'Évangile une action plus forte et une prédication propre non seulement à retenir les fidèles dans le giron de l'Eglise, mais encore à y ramener ceux qui en sont sortis et à briser la barrière de profonde ignorance et de stupides préjugés élevée contre la foi romaine.² Il souhaitait de toute son âme l'unité chrétienne des peuples; mais sachant bien que cette unité ne saurait s'effectuer en dehors des croyances et des directions de la vraie Eglise, il eut l'apostolique courage de l'écrire dans les colonnes hospitalières du "New York Herald."

Le problème des noirs n'est pas l'un des moins ardues ni des moins préoccupants pour les chefs de la société américaine. Mgr Satolli ne pouvait manquer de s'y intéresser. Dans une lettre au président d'un congrès catholique d'hommes de couleur, le Délégué ne peut cacher sa persuasion "que si l'influence civilisatrice des catholiques s'était exercée sur la race noire, depuis l'heureux jour de son émancipation, avec plus de zèle et avec plus de sagesse, la condition de cette race serait aujourd'hui, aux États-Unis, meilleure qu'elle n'est."³ Il rappelle ce que l'Eglise catholique a fait dans le passé pour la libération des esclaves et la régénération des noirs; il mentionne la croisade anti-esclavagiste entreprise et poursuivie sous l'impulsion généreuse de Léon XIII, et il trace en peu de mots le seul programme à suivre pour civiliser les noirs et améliorer efficacement leur sort.

A côté des fils de l'Afrique se croisent et se heurtent, dans la vaste république de l'Amérique du Nord, d'innombrables représentants de

¹ Cf. Mgr de T'Serclaes, *Le Pape Léon XIII*, t. II, ch. 32.

² *Loyalty to Church and State*, pp. 189-190.

³ *Ibid.*, p. 152. Cf. Tardivel, *ouv. cit.*, pp. 248-250.

toutes les nations de l'Europe. Ces éléments ethniques jetés là pêle-mêle et encore, pour ainsi dire, en fusion, traversent une période d'élaboration profonde et de changements progressifs. A tort ou à raison, Mgr Satolli jugeait inévitable, sous l'influence prédominante, l'absorption et la transmutation de ces divers groupes en un tout homogène.¹ Mais notons bien ses paroles que je tiens à transcrire textuellement:² "L'assimilation doit être spontanée, graduelle, et subordonnée au bien commun de toutes les parties qui composent le corps social. Elle ne doit être ni violente ni forcée." Lui-même se faisait un devoir et une joie de prêcher en italien devant ses compatriotes émigrés; et il écrivit un jour à quelques Canadiens-français qui avaient déposé une plainte contre leur évêque, que si ce dernier ne lui paraissait pas avoir manqué envers eux, il trouvait leur attachement à la langue natale absolument naturel et digne d'éloges et reconnaissait leur droit d'être desservis, de façon convenable, dans cette langue.

Le respect de l'autorité épiscopale le portait à maintenir les mesures prises par les évêques dans les limites de leur juridiction, chaque fois que ces mesures ne lui semblaient ni injustes en soi ni dommageables au bien commun. Dans les questions de tempérance, en particulier, il appuya de tout son pouvoir les efforts faits en différents diocèses pour endiguer la vague montante de l'alcoolisme. Il soutint également les pasteurs les mieux inspirés et les plus clairvoyants dans leur lutte contre les sociétés secrètes; et c'est, nous pouvons le croire, à son action prompte et ferme qu'est dû le décret du Saint-Office du 20 août 1894 rangeant au nombre des sociétés nommément défendues les "Odd Fellows", les "Sons of Temperance" et les "Knights of Pythias."

Tout était pour ce penseur sujet d'observation.

Il remarquait et il appréciait les qualités et les énergies du peuple américain. Et il appelait de ses vœux le jour où Dieu, par sa grâce, grefferait sur ces vertus civiques les vertus surnaturelles qui seules assurent la pleine valeur des âmes et la gloire durable des nations. Il eût voulu que la presse, comprenant son rôle le plus noble, servît d'instrument entre les mains divines pour préparer et opérer ce résultat. "La société, disait-il un jour, réunit tous les éléments d'un corps organisé. Le gouvernement en est la tête, le peuple les membres, la force militaire les muscles, la richesse économique le sang, la religion le cœur;" puis il ajoutait que dans ce corps "la presse joue le

¹ Nous osons exprimer l'opinion que si Mgr le Délégué eût reçu ses renseignements de sources moins intéressées, et si surtout il eût pu voir et étudier sur place l'admirable travail d'organisation accompli dans les centres franco-américains de l'Est depuis trente ans, il eût peut-être pensé différemment.

² *Ouv. cit.*, pp. 230-231.

rôle des poumons, puisqu'elle est comme l'organe de la respiration publique."¹ Il demandait donc que cet organe s'employât à entretenir et à activer partout non seulement la vie matérielle, mais encore et surtout la vie spirituelle et religieuse.

Et si le premier Délégué permanent du Pape aux États-Unis n'a pas vu toutes ses espérances immédiatement réalisées, il a pu du moins, avant de quitter cette charge si brillamment remplie, se rendre à lui-même le témoignage de n'avoir pas failli au devoir. "Quand on est investi d'une mission publique, il faut, déclara-t-il solennellement un jour,² conformer ses paroles et ses actes au mandat reçu. Jusqu'ici j'ai la satisfaction de croire, que, dans l'exercice de mes fonctions de Délégué apostolique en Amérique, j'ai agi en conformité des directions venues du Saint-Père; et c'est pourquoi j'attends en toute confiance le jugement du public et de la postérité. Justice, charité, loyauté envers l'Eglise et envers la nation, tels sont partout et tels seront toujours les traits caractéristiques de la diplomatie papale."

IV

LE PRINCE DE L'ÉGLISE

Vers la fin de 1895, Mgr Satolli fut élevé au cardinalat, et il reçut quelque temps après la barrette rouge, dans la cathédrale de Baltimore, des mains de son Éminence le cardinal Gibbons, au milieu d'un immense concours de fidèles et d'une foule de prélats et d'ecclésiastiques accourus de tous les points de l'Amérique du Nord et jusque de Québec.

Ce n'est toutefois qu'en octobre 1896 que le nouveau cardinal retourna à Rome où il fut bientôt nommé préfet de la Sacrée Congrégation des Études et archiprêtre de Saint-Jean-de Latran, charges qu'il occupa jusqu'à sa mort. Il devint aussi président de l'Académie romaine de Saint-Thomas d'Aquin, et il fut plus tard appelé par le Pape à faire partie des commissions pontificales suivantes: commission pour la révision des livres de l'Eglise orientale, commission pour la réunion des Eglises dissidentes, commission pour les études bibliques, commission pour l'unification et la codification du droit canonique.

On peut voir par là, quelle haute idée le chef de l'Eglise avait de sa science, et quelle part considérable le cardinal Satolli prit à tous les travaux d'ordre intellectuel et doctrinal dont la chaire apostolique est le foyer.

¹ *Ibid.*, pp. 164-165.

² *Ibid.*, p. 100.

Cet esprit transcendant ne pouvait, en aucune fonction, s'abstraire totalement des sphères métaphysiques où il avait plané pendant si longtemps, et, dès les premiers loisirs, il y revenait comme par un instinct profond. En 1897, il publia sur les habitudes et les vertus¹ un commentaire très serré d'une partie de la Somme de saint Thomas, commentaire où l'on retrouve toute la puissance de compréhension du docteur pérugin et qui est fait pour compléter l'un de ses traités théologiques antérieurs. La "Somme" ne quittait pas sa table. Semblable à ces lettrés de carrière qui, parvenus au soir de la vie, relisent avec une singulière volupté leurs classiques, le cardinal Satolli, déjà vieillissant, éprouvait une joie intense à ramener son regard sur quelque page de l'Ange de l'Ecole. Il nous en faisait à nous-même l'aveu, un jour que nous étions admis dans son intimité, l'année même qui précéda sa mort. "Je lis un petit article tous les jours,"² nous disait-il aimablement. Et le plaisir de cette lecture rayonnait sur son front comme une lueur de soleil couchant.

Le cardinal suivait de près le mouvement théologique et philosophique dans tous les pays. Son œil très ouvert se portait de préférence sur les maisons de haut enseignement et sur les publications diverses, revues, livres, brochures, destinées à vulgariser et à défendre les saines doctrines. L'apparition de nouveaux ouvrages fidèles à la tradition scolastique, et imbus du plus pur esprit thomiste, lui causait la satisfaction la plus vive.

Rien n'échappait à son attention vigilante. En 1906, il adressa en sa qualité de préfet de la Congrégation des études, aux Instituts catholiques de France, une lettre tout à la fois élogieuse et prudente où il signalait le danger "de donner trop d'importance, dans le développement des thèses pour le doctorat, à des discussions d'histoire et de critique sur des points très minutieux et singuliers, tout en laissant de côté les questions les plus amples et les plus universelles de théologie dogmatique et de philosophie rationnelle." En 1908, au nom de la même sacrée Congrégation qu'il présidait, il publia une autre lettre très sage et très opportune sur l'usage du latin dans l'enseignement philosophique et théologique.

Heureux de constater les résultats obtenus dans la réforme des études ecclésiastiques, il regrettait pourtant que ce progrès ne fût pas plus général, et qu'on demeurât, en certains milieux, indifférent et même réfractaire aux directions données par le Saint-Siège. C'est dans ces milieux, il faut le dire, que le modernisme naissant trouva son champ de culture. Et c'est, d'autre part, la culture scolastique si formellement prescrite par Léon XIII, et si puissamment fécondée

¹ *De Habitibus* (Rome, Typ. polygl.).

² "Leggo un articolo ogni giorno."

par des hommes comme les Zigliara, les Satolli, les Billot et les Mercier, c'est, dis-je, cette culture et ce retour aux fortes doctrines qui garda intacte dans les écoles l'antique pensée catholique et qui opposa aux menées de l'erreur l'obstacle humain le plus ferme.

Le cadre restreint de cette étude ne nous permet pas de parler de la collaboration du cardinal Satolli dans le gouvernement général de l'Eglise, et spécialement de l'Eglise d'Amérique. Notons seulement que dans le conclave de 1903 où fut élu Pie X, par son coup d'œil si vif, par son action si franche, par sa parole si persuasive, il joua, au témoignage de l'histoire, un rôle décisif. C'est lui surtout, assure-t-on, qui rallia les suffrages autour de la candidature du patriarche de Venise, et qui triompha de l'humilité et des dernières résistances du pieux cardinal.¹

Au milieu des plus grands honneurs, sa vie était simple et sans faste. Il n'était pas de ceux qui croient que l'influence du bien se mesure par le bruit de la vanité et l'éclat des oripeaux. Il habitait, dans un quartier paisible, de modestes appartements contigus à l'ancienne basilique de Saint-Jean de Latran; et l'une de ses récréations favorites était de se promener seul, ou avec un ami, sur la terrasse qui couronne l'édifice, et d'où l'œil embrasse, dans une vision chargée d'histoire, les ruines de Rome païenne et les merveilles de Rome chrétienne.

Sa porte s'ouvrait très large, et sa main se tendait très affable à tous ceux des nombreux visiteurs qui venaient le voir, le consulter, lui confier quelque affaire sérieuse. Il se montrait particulièrement accueillant pour ses anciens élèves, lesquels, dispersés dans toutes les parties du monde, lui apportaient de partout l'hommage de la reconnaissance et du souvenir. Nous avons vu là tour à tour, joyeux de se retrouver en face de cette mâle figure et animés d'un même sentiment de vénération sincère, l'archevêque d'Athènes, un évêque de la Colombie britannique, un chef d'Ordre religieux de la province de Québec. Le Cardinal se plaisait à mêler aux préoccupations du présent les réminiscences du passé. Et ce passé qui avait pris le meilleur de son effort et de son âme, et qui pour lui était surtout le triomphe d'une pensée et l'avènement d'une doctrine, ne manquait certes pas de charme. Dieu avait béni son travail. Il l'en remerciait chaque jour, et il associait à ces hommages et à ces actions de grâces un culte presque filial pour le saint Docteur qu'il n'avait cessé de suivre comme un guide aimé, et dont l'image rayonnante illuminait toute sa vie.

¹ Cf. *Revue des deux Mondes*, p. 283 (t. XX, 1904).

C'est en ces sentiments de piété et de gratitude qu'il est mort, le 8 janvier 1910,¹ dans l'ombre glorieuse du vieux temple constantinien, à deux pas d'un superbe mausolée du grand pontife qui fut pour lui, dès sa jeunesse, un protecteur puissant et fidèle, et auquel il avait voué une indéfectible affection.

V

L'AMI DU CANADA

L'Eglise venait de perdre un de ses fils les plus dignes, l'Italie, une de ses illustrations les plus hautes. Ajoutons que le Canada perdait en même temps, dans sa personne, un de ses amis les plus vrais.

En effet, le cardinal Satolli portait à notre pays, à ses institutions religieuses, à son avenir intellectuel, à ses destinées nationales, le plus bienveillant intérêt. C'est en partie à son influence, jointe à celle du cardinal dominicain Zigliara, que la plupart de nos maisons enseignantes doivent le relèvement des études scolastiques remarqué chez nous depuis trente ans. Et rien ne pouvait mieux répondre à ses désirs, qui étaient les propres désirs de Léon XIII, que l'introduction comme texte, dans les classes théologiques de l'Université Laval, de la Somme de saint Thomas d'Aquin. Nombre de lettres attestent avec quel zèle sympathique et quelle attention soucieuse il observait chaque pas fait, en notre pays, dans le domaine du haut enseignement. Il plaçait cette mission d'enseigner au-dessus de bien d'autres fonctions publiques, et il augurait de la formation donnée à notre jeunesse d'après les méthodes doctrinales les plus sûres, d'innombrables avantages pour l'Eglise et la société canadienne.

Pendant les deux séjours qu'il fit comme envoyé papal aux États-Unis, Mgr Satolli voulut bien donner à notre patrie, et surtout à notre province française, une marque tangible de sa particulière estime.

Il vint une première fois à Québec dans l'automne de 1889, et il y fut l'objet du plus enthousiaste accueil. Une adresse fort élogieuse lui fut présentée, à l'Université Laval, de la part de cette institution,² et le prélat romain y répondit par une brillante improvisation latine. "Dans sa réponse à l'adresse, disait le lendemain l'un de nos journaux, Mgr Satolli a exprimé son contentement pour la belle réception que lui faisaient les professeurs et les élèves de l'Uni-

¹ On dit que le pape Pie X, en apprenant cette nouvelle, exprima le très vif chagrin qu'il en ressentait et rappela que c'était lui, le cardinal Satolli, qui l'avait déterminé à accepter la tiare.

² Voir l'*Annuaire de l'Université Laval* (1890-91), pp. 76-77 et 94-95.

versité Laval. Et après avoir indiqué les trois pensées dominantes de l'adresse, il dit d'abord qu'il avait une dette particulière de gratitude envers une institution qui lui avait jadis conféré un diplôme de Docteur, et pour laquelle il professait depuis longtemps des sentiments d'estime et de bienveillance. Il manifesta aussi le plaisir qu'il sentait en voyant parmi les professeurs de Laval des hommes qu'il avait lui-même formés et dirigés dans les sentiers de la science sacrée. Parlant ensuite des rapports du Saint-Père avec l'Université Laval, Mgr Satolli affirma que le Souverain Pontife a toujours eu pour cette institution une très grande bienveillance, et qu'il n'a rien négligé non seulement pour que l'Université Laval conservât sa splendeur, mais encore pour qu'elle grandît à la face du Canada, de toute l'Amérique et de toutes les universités du monde civilisé." L'orateur termina en disant: "que l'universalité des sciences, dont une université bien organisée doit être l'expression, est comme une pyramide dont la base réside dans les premiers principes de la raison d'accord avec la vérité révélée; le centre est le perfectionnement intellectuel et moral, civil et politique de l'humanité; le couronnement est Jésus-Christ, Dieu fait homme, Jésus-Christ, source de toute vérité, terme de toutes les aspirations, Jésus-Christ qui soutient par sa vertu l'Eglise qu'il a fondée."

Après cette manifestation académique, Mgr Satolli visita les musées de l'Université, les institutions religieuses de la ville; puis le soir eut lieu en son honneur, au palais cardinalice, une réception de gala, pendant laquelle les plus hauts dignitaires de l'Eglise et de l'Etat et grand nombre d'autres personnages vinrent offrir à son Excellence leurs hommages respectueux.

De nouveau, dans l'automne de 1894, alors qu'il était Délégué apostolique à Washington, Mgr Satolli accepta l'invitation qui lui fut faite de venir au Canada. Il s'arrêta d'abord à Montréal où les autorités religieuses lui firent royalement les honneurs de la ville. Une discussion théologique avait été organisée au Grand Séminaire à cette occasion. Mgr Satolli y assista, et témoigna éloquemment sa joie du succès remporté par les disputants, et de l'essor donné dans la cité montréalaise aux études ecclésiastiques. Interrogé par les journalistes, il dit l'admiration que lui inspirait l'élan vigoureux de notre pays, et la confiance qu'il en concevait pour notre avenir.

De Montréal, l'illustre voyageur se rendit à Québec où l'attendaient des figures connues et des sympathies fidèles. Il eut pour l'université qui cinq ans auparavant l'avait si cordialement accueilli, des attentions toutes spéciales. Laissons ici la parole à Mgr Laflamme, alors recteur, qui dans son allocution de clôture des cours universitaires, met cette visite au premier rang des événements

heureux de l'année: "En premier lieu," écrit-il,¹ "se place la visite de Son Excellence Mgr Satolli, archevêque de Lépante, délégué apostolique aux États-Unis. Venu au Canada sur les invitations et les instances réitérées de Mgr l'archevêque de Cyrène, Son Excellence a passé plusieurs jours au milieu de nous. Ce maître des fortes études théologiques nous a laissé de son passage des souvenirs que ne perdront jamais ceux qui ont eu le bonheur d'être alors avec nous. Par une condescendance à laquelle nous avons été extrêmement sensibles, le Délégué apostolique, avec une parfaite bonne grâce, a consenti à donner à la faculté de théologie un de ces cours aussi brillants que profonds, où la sûreté et la solidité de la doctrine rivalisent avec l'éclat et la richesse de la forme, et qui ont fait du brillant professeur l'idole de tous ses anciens élèves. Non content de ce témoignage d'extrême bienveillance, Mgr Satolli a bien voulu assister de plus à une dispute philosophico-théologique, dont les thèses défendues par des élèves de la faculté, étaient attaquées par d'anciens élèves de l'illustre prélat venus de différents points du pays, depuis Halifax jusqu'à Ottawa. Si nous ne craignons pas d'être taxés de présomption, nous ajouterions que Son Excellence a paru satisfait de la manière dont les argumentateurs s'étaient acquittés de leur besogne, et l'Université, de son côté, est heureuse de leur donner ce soir les diplômes qu'ils ont conquis dans cette circonstance."²

Une fois entré dans le Sacré Collège, Mgr Satolli n'a pas cessé de s'intéresser aux choses du Canada, aux progrès de la science sacrée et aux développements de l'Eglise véritable dans nos contrées.

Il se réjouissait du rang honorable pris par nos écrivains,—historiens, littérateurs, hommes de science,—dans le monde de la pensée; il s'applaudissait surtout de n'avoir pas été étranger au caractère nettement thomiste de nos écoles philosophiques et théologiques dont il admirait la docilité constante aux directions doctrinales du Saint-Siège.

Nos soucis nationaux ne lui étaient pas inconnus. Et quoi qu'il pensât des groupes ethniques des États-Unis où l'anglais est le seul idiome officiel, il ne cachait pas ses sympathies pour notre langue française, ni ses vues sur nos destinées particulières en ce pays. Étant en séjour à Rome il y a quelques années, nous lui présentâmes un mémoire sur nos difficultés de race, sur notre situation dans ces régions explorées, colonisées et fécondées par nos pères, et sur l'importance pour nous, et pour l'avenir de la religion, de recevoir dans la

¹ *L'Annuaire de l'Université Laval* (1895-96), p. 122.

² Les deux soutenant étaient: pour la philosophie, l'abbé Camille Roy, aujourd'hui professeur à la faculté des Lettres de l'Université, et pour la théologie, l'abbé J.-E. Grandbois, devenu professeur à la faculté de Théologie.

distribution des charges ecclésiastiques la part équitable et proportionnelle qui nous revient. Le cardinal lut attentivement nos remarques, et, quelques jours après, il n'hésita pas à nous déclarer de la façon la plus formelle que les revendications canadiennes-françaises au Canada étaient fondées. Sa haute intelligence des prescriptions de la loi morale, et sa parfaite connaissance des vraies traditions de l'Eglise, ne lui permettaient sur ce point aucun doute.

Nous sommes heureux de clore le présent travail par cet hommage bien véridique rendu à l'esprit de justice d'un homme qui fut l'une des lumières et des célébrités théologiques de notre époque, que nous avons eu l'avantage de connaître intimement, qui poussa même la condescendance jusqu'à honorer de son amitié notre humble personne, et de qui nous garderons un impérissable souvenir.

Un essai d'arbitrage international.

Par P.-B. MIGNAULT, M.S.R.C.

(Lu à la réunion de mai 1916)

Le 11 janvier 1909, M. James Bryce, alors ambassadeur britannique à Washington, et M. Elihu Root, alors Secrétaire d'État des États-Unis, signaient à Washington un traité entre Sa Majesté, le roi, et les États-Unis d'Amérique, intitulé "Traité relatif aux eaux limitrophes et aux questions surgissant le long de la frontière entre le Canada et les États-Unis."¹

Il y avait, lors de la signature de ce traité, près d'un siècle que la paix régnait entre l'Empire Britannique et les États-Unis. Ce n'est pas à dire que pendant ce siècle il n'y avait pas eu des orages, et même des dangers de conflit armé entre les deux pays, mais ces orages avaient été conjurés et ces conflits apaisés, soit par des négociations directes, soit par des recours à l'arbitrage librement consentis et fidèlement exécutés par les hommes d'État des deux nations.

Un des conflits les plus graves avait résulté des attaques contre le commerce américain par le vaisseau Alabama et autres navires, qui, après avoir été construits et équipés en Angleterre, s'étaient échappés de ports anglais pendant la guerre civile aux États-Unis. Par le traité de Washington, en 1871, il fut convenu que les réclamations du gouvernement américain seraient soumises à un tribunal d'arbitrage composé de cinq arbitres nommés respectivement par le président des États-Unis, par la reine, par le roi d'Italie, par le président de la Confédération Suisse et par l'empereur du Brésil. Ce tribunal rendit sa décision à Genève, le 14 septembre 1872, et bien que l'arbitre anglais eût exprimé son dissentiment, l'Angleterre paya fidèlement au gouvernement américain l'énorme indemnité de \$15,500,000 que la majorité des arbitres avait accordée.

Plus récemment, pour ne citer qu'un autre exemple qui nous touche de près, la question des frontières de l'Alaska fut soumise en 1903 à un tribunal d'arbitrage composé de six arbitres, dont trois furent nommés par Sa Majesté—ce furent lord Alverstone, sir Louis Jetté et sir Allan Aylesworth—et trois furent désignés par le président des États-Unis, savoir MM. Elihu Root, Henry Cabot Lodge et George Turner. La décision de ce tribunal, signée par lord

¹ Je donne ce titre ainsi que tous extraits de ce traité d'après le texte français contenu en l'annexe de la loi 1-2 Geo. V, ch. 28 (Canada).

Alverstone et les trois arbitres américains, fut fidèlement exécutée de part et d'autre, bien qu'elle fût regardée comme peu favorable à nos intérêts.

On peut donc affirmer sans hésitation que nos deux pays, depuis plus d'un siècle, ont trouvé dans l'arbitrage international un mode de régler les conflits, même les plus graves, sans jamais recourir ni, je puis ajouter, sans jamais songer à recourir au mode barbare, cruel et insensé de la guerre. Pour nos deux pays, dans leurs relations réciproques, et quels que fussent les dissentiments, les provocations, les querelles même, il n'y a eu depuis cent ans qu'une seule solution et qu'un seul remède possibles, l'arbitrage international.

HISTOIRE DE L'ARBITRAGE INTERNATIONAL.

Envisageant maintenant l'ensemble des nations du monde, il sera intéressant de tracer brièvement l'histoire de l'arbitrage international. Pour cela, je n'éprouve pas le besoin de remonter au-delà du commencement du XIX^e siècle. En prenant ce point de départ, je ne veux pas prétendre que le recours à l'arbitrage, comme mode de règlement de conflits entre nations, fût inconnu auparavant. Au contraire, l'histoire du moyen âge nous offre des exemples notables d'arbitrage international. Ainsi le pape a fréquemment été choisi comme médiateur ou même comme juge suprême entre des États chrétiens qui se trouvaient en état de guerre, et son intervention a le plus souvent ramené la paix entre les belligérants. De même les rois de France, et notamment saint Louis et Louis XI, ont quelquefois agi comme arbitres de conflits entre leurs voisins.

Cependant la période qui nous intéresse davantage est la période contemporaine, car c'est surtout depuis le commencement du XIX^e siècle que la propagande en faveur de l'arbitrage international a été ardente et ininterrompue. Et ce mouvement s'est notamment accentué de nos jours. Je le ferai voir par quelques chiffres. Ainsi de 1794 à 1820 on compte quinze arbitrages; de 1821 à 1840, huit; de 1841 à 1860, vingt; de 1861 à 1880, quarante-quatre; de 1881 à 1900, quatre-vingt-dix.¹

Et il en est de même des traités d'arbitrage entre États, nés sous l'impulsion des deux Conférences de La Haye. Ici encore je me contenterai de donner quelques chiffres. En 1903 on a conclu deux traités d'arbitrage; en 1904, vingt-neuf; en 1905, quarante-huit; en 1906, quarante-neuf; en 1907 cinquante-trois². Je n'ai pas les

¹ Despagnet, *Cours de Droit International Public*, 4e édition, par Ch. de Boeck, 1910, p. 1335.

² Même ouvrage, p. 1384.

chiffres pour les années suivantes, mais on le voit, la progression ascendante du nombre de ces conventions est très remarquable. Cependant, et chose plus remarquable encore, et ironie, disons le mot, tragédie des espérances et des illusions humaines, ce progrès notable de l'idée de l'arbitrage international semble avoir abouti à la plus grande guerre des temps anciens et modernes. Il ne faut pas dire toutefois que tout est perdu, fors l'honneur d'avoir voulu substituer l'empire de la raison à celui de la force brutale. J'éprouve même un sentiment d'optimisme qui me fait croire, au contraire, que tout va être sauvé, car l'immensité du malheur actuel nous conduira à adopter un remède héroïque. Et si nous avons aujourd'hui moins d'illusions peut-être qu'avant le 1er août 1914, ce n'est pas là une raison de ne pas reprendre à neuf, et avec une nouvelle ardeur, l'idée du règlement pacifique des conflits internationaux. Cette idée est désormais à l'ordre du jour et on la discute partout. Elle a pour partisans tous ceux qui, comme Térence, peuvent se dire: *homo sum, nil humanum a me alienum puto*.

CONFÉRENCES ET CONVENTIONS DE LA HAYE.

J'ai nommé il y a un instant les deux Conférences de La Haye, et je ne puis les passer sous silence, bien qu'il soit maintenant avéré qu'elles n'ont pas réussi à rendre plus humain le recours à la force armée.

La première Conférence de La Haye, dite Conférence de la Paix, s'est réunie le 18 mai 1899. Vingt-six États y étaient représentés, mais chose regrettable, le Saint-Siège, la plus grande autorité morale et religieuse du monde, en fut exclu grâce aux instances de l'Italie.

Cette Conférence s'occupa de la question du désarmement, de la réglementation des lois de la guerre et de l'arbitrage international. Je ne veux parler ici que de la dernière question, mais il faut bien reconnaître qu'elle ne reçut de la Conférence aucune solution réelle.

En présence de difficultés d'ordre pratique, et des objections de plusieurs délégations, on dût renoncer à l'espoir de formuler un projet de règlement pacifique de conflits internationaux qui pût conduire à un traité d'arbitrage obligatoire et mondial. On se contenta d'adopter une déclaration assez platonique et qui se réduit à un simple vœu. "Dans les questions d'ordre juridique, et en premier lieu dans les questions d'interprétation ou d'application des conventions internationales," dit l'article 16 de la Convention du 29 juillet 1899 relative au règlement pacifique des conflits internationaux, "l'arbitrage est reconnu par les Puissances signataires comme le moyen le plus efficace et en même temps le plus équitable de régler les litiges qui n'ont pas été résolus par les voies diplomatiques."

Cependant, pour faciliter le recours immédiat à l'arbitrage pour le règlement de leurs conflits, les Puissances signataires de cette Convention se sont engagées à organiser "une Cour permanente d'arbitrage, accessible en tout temps et fonctionnant, sauf conventions contraires des parties, conformément aux règles de procédure insérées dans la présente Convention" (art. 20). Cette Cour permanente devait être constituée comme suit: chaque Puissance désignerait quatre personnes au plus, "d'une compétence reconnue dans les questions de droit international, jouissant de la plus haute considération morale et disposées à accepter les fonctions d'arbitre" (art. 23).

On ne créait pas ainsi un tribunal, mais on dressait une liste officielle de personnes compétentes en matière de droit international, ou si on veut une liste de jurés internationaux. Lorsque quelques-unes des Puissances signataires voudraient s'adresser à la Cour permanente pour le règlement d'un différend survenu entre elles, le choix des arbitres appelés à former le tribunal devait être fait dans la liste générale des membres de la Cour, sauf, bien entendu, le droit des Puissances de constituer autrement ce tribunal. Chaque partie nommerait deux arbitres, et ceux-ci choisiraient un sur-arbitre (art. 24). Et la Conférence adopta un chapitre réglant la procédure arbitrale devant ce tribunal.

On voit que si la question de l'arbitrage obligatoire n'avait pas été réglée, elle avait du moins été posée par la Conférence de 1899. La deuxième Conférence de la Paix, qui se réunit à La Haye, le 15 juin 1907, reprit cette question avec la ferme volonté de la résoudre si possible. Cette fois, comme en 1899, c'était le Tzar de la Russie qui avait pris l'initiative de la convocation. Quarante-quatre États répondirent à l'appel, mais encore une fois le Saint-Siège n'avait pas été invité à se faire représenter. On avait sans doute oublié, dans cette Conférence qui voulait assurer la paix universelle, la parole du psalmiste: *Nisi Dominus custodierit civitatem, frustra vigilat qui custodit eam!*

Je néglige les autres travaux de la deuxième Conférence, pour ne m'occuper que de l'arbitrage international. Cette question était hérissée de difficultés d'ordre pratique. Tout le monde admettait qu'on ne pouvait songer à imposer l'arbitrage si ce n'est pour des contestations d'ordre juridique. Les difficultés politiques, qui sont presque exclusivement celles qui provoquent les hostilités, y échappent entièrement par leur nature même. Et si une question de droit, qui, en elle-même, pourrait être l'objet d'un jugement, touche à l'honneur, à l'indépendance ou aux intérêts vitaux d'un État, celui-ci ne peut raisonnablement la soumettre à l'arbitrage sans porter atteinte à sa souveraineté.

Le champ d'action de l'arbitrage obligatoire se trouvait donc bien restreint, mais, même dans ces conditions, il pouvait être très utile, si au moins on pouvait s'entendre pour l'imposer à toutes les nations. Trois objections furent formulées par l'Allemagne.

Premièrement une sentence arbitrale peut bien obliger les parties, mais elle reste sans effet pour les autres États. Si la même question se soulève de nouveau entre deux autres nations, elle sera probablement jugée par d'autres arbitres, et la sentence peut très bien être tout autre. On se trouverait ainsi en présence de décisions contradictoires relativement à l'interprétation d'un même traité.

Deuxièmement. Peut-on espérer que les tribunaux des deux États en litige conformeront leur propre jurisprudence à la décision d'un tribunal international d'exception, qui est appelé à disparaître aussitôt qu'il a rendu son arrêt ?

Enfin, et troisièmement, les sentences ne peuvent s'exécuter que par le concours du pouvoir législatif, librement exprimé par les parlements ou assemblées législatives de chacune des parties. Comment une nation peut-elle d'avance promettre que ce concours ne sera pas refusé ?

Après de longues discussions et de nombreuses tentatives de conciliation, la formule suivante reçut l'appui de trente-cinq délégations contre cinq et quatre abstentions :

"Les différends d'ordre juridique et, en premier lieu, ceux relatifs à l'interprétation des traités existants entre deux ou plusieurs États contractants qui viendraient désormais à se produire entre eux, et qui n'auraient pu être réglés par la voie diplomatique, seront soumis à l'arbitrage, à la condition toutefois qu'ils ne mettent en cause ni les intérêts vitaux, ni l'indépendance ou l'honneur de l'un ou de l'autre des dits États, et qu'ils ne touchent pas aux intérêts des autres États ne participant pas au litige."¹

Comme cette formule n'avait pas reçu l'appui de l'unanimité des délégations, on ne pouvait songer à conclure un traité d'arbitrage obligatoire. On ne voulut pas cependant se séparer en constatant ce manque d'accord, et on chercha et à la fin on s'entendit unanimement sur cette déclaration qui fut insérée dans l'Acte final de la Conférence :

"La Conférence, se conformant à l'esprit d'entente et de concessions réciproques qui est l'esprit même de ses délibérations, a arrêté la déclaration suivante qui tout en réservant à chacune des Puissances représentées le bénéfice de ses votes, leur permet à toutes d'affirmer les principes qu'elles considèrent comme unanimement

¹ Les États qui votèrent contre cette formule furent l'Allemagne, l'Autriche-Hongrie, la Grèce, la Roumanie et la Turquie.

reconnus. Elle est unanime: 1. à reconnaître le principe de l'arbitrage obligatoire; 2. à déclarer que certains différends, et notamment ceux relatifs à l'interprétation et à l'application des stipulations conventionnelles internationales, sont susceptibles d'être soumis à l'arbitrage obligatoire sans aucune restriction. Elle est unanime enfin à proclamer que, s'il n'a pas été donné de conclure dès maintenant une convention en ce sens, les divergences d'opinion qui se sont manifestées n'ont pas dépassé les limites d'une controverse juridique, et qu'en travaillant ici ensemble pendant quatre mois, toutes les Puissances du monde non seulement ont appris à se comprendre et à se rapprocher davantage, mais ont su dégager, au cours de cette longue collaboration, un sentiment très élevé du bien commun de l'humanité."

C'était maintenir l'arbitrage international obligatoire à l'ordre du jour. Et comme la seconde Conférence de la Paix ne s'est séparée qu'après avoir décidé qu'il en serait tenu une troisième—il est visible qu'on ne connaissait pas alors l'avenir—les partisans de cet arbitrage pouvaient se flatter d'avoir obtenu, sinon une victoire complète, du moins un succès préliminaire.¹

TRAITÉ DU 11 JANVIER 1909 ENTRE LA GRANDE-BRETAGNE ET LES ÉTATS-UNIS.

Je reviens à mon point de départ et au traité du 11 janvier 1909 au sujet des eaux limitrophes entre le Canada et les États-Unis. C'est bien là ce que j'appelle un essai d'arbitrage international.

Ce traité est le résultat surtout des travaux et des activités de la Commission internationale des voies d'eau, International Waterways Commission, créée par les deux pays avec mission de s'enquérir des questions relatives aux voies d'eau, qui forment une partie si considérable de la frontière entre le Canada et les États-Unis. Les négociations tendant à la confection de ce traité ont commencé en 1907. Les négociateurs anglais furent M. James Bryce, ambassadeur à Washington, maintenant viscount Bryce, et M. George Gibbons, maintenant sir George Gibbons, l'envoyé du gouvernement canadien. Du côté américain, je puis nommer comme négociateurs, M. Elihu Root, alors Secrétaire d'État sous le président Roosevelt, et maintenant membre du Sénat, M. Clinton, membre de la section américaine de la Commission internationale des voies d'eau, et M. Chandler Anderson du département du Secrétaire d'État:

¹ J'ai largement puisé, en faisant l'analyse de la deuxième Conférence de la Paix sur cette importante question, dans l'ouvrage précité de MM. Despagne et de Boeck.

Je ne puis mieux rendre compte du but de notre traité qu'en citant le langage de son préambule:

"Sa Majesté le Roi du Royaume-Uni de la Grande Bretagne et d'Irlande et des possessions britanniques au-delà des mers, Empereur de l'Inde, et les États-Unis d'Amérique, désirant également prévenir tous différends relativement à l'usage des eaux limitrophes et pour régler toutes les questions qui sont actuellement pendantes entre les États-Unis et le Dominion du Canada impliquant les droits, obligations ou intérêts de l'un et l'autre pays relativement à son voisin et à ceux des habitants des deux pays le long de leur frontière commune, et dans le but de pourvoir à l'ajustement et au règlement de toutes questions qui pourraient surgir dans l'avenir, ont résolu de conclure un traité pour atteindre ces fins."

Il n'est pas nécessaire d'analyser toutes les dispositions de ce traité, et je me limiterai à celles qui pourvoient à la création d'une commission internationale et qui déterminent son champ d'action. Par l'article VII, il est décrété que "les hautes parties contractantes conviennent de créer et de maintenir une commission conjointe internationale des États-Unis et du Canada, composée de six commissaires, dont trois pour les États-Unis, et nommés par le président, et trois pour le Royaume-Uni et nommés par Sa Majesté, sur la recommandation du gouverneur en conseil du Dominion du Canada."

Cette Commission désignée "International Joint Commission"—la traduction officielle dit: "Commission conjointe internationale"—est ce que les auteurs de droit international appellent une *commission mixte*, savoir: dit Despagnet, n° 729 et p. 1335, une commission "composée de délégués des États intéressés qui sont chargés de résoudre souverainement une difficulté internationale; ces commissions tiennent de l'arbitrage en ce que leurs membres doivent trancher la difficulté en se plaçant au point de vue du droit, sans essayer de faire triompher les intérêts de leurs pays comme le font des négociateurs; elles se rapprochent des négociations directes et de la transaction en ce que les membres qui les composent sont des délégués des parties en cause et non des tiers indépendants investis du pouvoir de juger par les parties elles-mêmes. Cependant elles sont quelquefois complétées par la désignation d'un tiers-arbitre, généralement indépendant des pays intéressés, qui donne à la commission un véritable caractère arbitral."

On voit donc que généralement le tribunal arbitral est recruté entièrement ou partiellement parmi des tiers, souverains ou citoyens d'États étrangers au litige. La commission mixte se compose de délégués des nations mêmes qui veulent faire décider leur contestation. Mais l'un et l'autre agit comme un tribunal et ses membres

ne se considèrent pas comme les agents des parties. C'est un tribunal arbitral proprement dit qui a jugé l'affaire de l'Alabama; c'est au contraire une commission mixte qui a été chargée de trancher la question des frontières de l'Alaska.

COMMISSION INTERNATIONALE CRÉÉE PAR CE TRAITÉ.

Mais envisageant spécialement la Commission créée par le traité de 1909, disons que c'est tantôt une cour jugeant en dernier ressort des affaires qui intéressent bien le Canada et les États-Unis d'une manière générale, mais plus particulièrement les citoyens de ces deux pays; tantôt c'est une commission d'enquête chargée de faire rapport aux gouvernements du Canada et des États-Unis, lorsque ceux-ci lui renvoient une affaire pour étude; tantôt enfin c'est une juridiction arbitrale à laquelle le Royaume-Uni et les États-Unis peuvent remettre pour décision finale une contestation née entre eux. C'est de plus—et en cela elle diffère à la fois des tribunaux d'arbitrage et des commissions mixtes qui après la prononciation de leur jugement cessent d'exister—une juridiction permanente que les deux pays s'obligent de maintenir tant que durera le traité.

Je viens d'indiquer la triple juridiction de la Commission conjointe internationale. Quelques mots d'explications ne seront pas sans intérêt et me fourniront l'occasion de signaler les dispositions du traité qui se rapportent à mon sujet.

Et d'abord la Commission connaît en dernier ressort de demandes faites par des particuliers qui veulent se servir des eaux dites limitrophes ou de cours d'eau traversant la frontière de manière à modifier leur débit ou leur niveau naturels.

A cet effet il a été convenu aux articles III et IV, que "outre les usages, obstructions et détournements permis jusqu'ici ou autorisés ci-après, par convention spéciale entre les parties, aucun usage ou obstruction ou détournement nouveaux ou autres, d'un côté ou de l'autre de la frontière, influençant le débit ou le niveau naturels des eaux limitrophes de l'autre côté de la frontière, ne pourront être effectués si ce n'est par l'autorité des États-Unis ou du Dominion canadien dans les limites de leurs territoires respectifs et avec l'approbation, comme il est prescrit ci-après, d'une commission conjointe qui sera désignée sous le nom de la Commission internationale."

Et les hautes parties contractantes sont convenues, "sauf pour les cas spécialement prévus par un accord entre elles, de ne permettre, chacune de son côté, dans les eaux qui sortent des eaux limitrophes, non plus que dans les eaux inférieures des rivières qui coupent la frontière, l'établissement ou le maintien d'aucun ouvrage de protection

ou de réfection, d'aucune digue ou autre obstacle dont l'effet serait d'exhausser le niveau naturel des eaux de l'autre côté de la frontière, à moins que l'établissement ou le maintien de ces ouvrages n'ait été approuvé par la susdite Commission conjointe internationale."

Il est visible que la Commission décide ici en dernier ressort. Qu'il s'agisse, par exemple, d'exploiter un pouvoir hydraulique sur une rivière de frontière, comme la rivière Niagara ou la rivière Sainte-Marie au Sault Sainte-Marie, puisque le niveau naturel de l'eau sera changé, il faut d'abord obtenir l'autorisation de chaque pays dans les limites de leurs territoires respectifs, et ensuite l'approbation de la Commission. On peut dire que chaque pays envisagera la question selon son intérêt particulier, tandis que la Commission se préoccupera surtout de l'intérêt international, si je puis m'exprimer ainsi, tout en veillant à la protection des droits des citoyens des deux côtés de la rivière.

En deuxième lieu la Commission agit comme Commission d'enquête en vertu de l'article IX du traité. Par cet article les hautes parties contractantes sont convenues que "toutes les autres questions ou différends qui pourront s'élever entre elles et impliquant des droits, obligations ou intérêts l'une relativement à l'autre ou aux habitants de l'autre le long de la frontière. . . . seront soumis de temps à autre à la Commission conjointe internationale pour faire l'objet d'un examen et d'un rapport, chaque fois que le gouvernement des États-Unis ou celui du Canada exigera que ces questions ou différends lui soient ainsi référés."

Comme je l'ai dit, c'est une enquête qui se fait alors devant la Commission. Celle-ci assermente et entend les témoins, qu'elle peut contraindre à comparaître devant elle. Elle fait son rapport aux gouvernements, avec les conclusions et recommandations qui lui paraissent appropriées, mais ces rapports ne sont pas considérés comme des décisions des différends soumis, soit en fait soit en droit, et ne sont en aucune manière de la nature d'une sentence arbitrale.

Cette juridiction d'enquête de la Commission internationale est probablement celle qu'elle sera appelée à exercer le plus souvent. Je ne puis la rapprocher que de la juridiction des Commissions internationales d'enquête dont il est question aux Conventions de La Haye (articles 9 à 36 de la Convention pour le règlement pacifique des conflits internationaux, adoptée à la deuxième Conférence de la Paix). Quand elle agit pour ces fins d'enquête, la Commission n'engage pas les hautes parties contractantes, qui conservent toute leur liberté d'action, mais il est clair que son rapport et ses recommandations ne peuvent être écartés à la légère. De plus, par le seul fait de réunir devant elle les parties intéressées au règlement d'un conflit

international, elle peut souvent les mettre d'accord, ou du moins les porter à s'entendre sur la plupart des questions en litige, et en cela elle agira très efficacement comme tribunal de conciliation, contribuant ainsi à favoriser la bonne entente et les bons rapports de voisinage entre les citoyens des deux pays.

Enfin la Commission exerce les fonctions d'un tribunal arbitral, avec le droit de rendre une décision sans appel, quand les deux gouvernements, celui des États-Unis, de l'avis et du consentement du Sénat, et celui de Sa Majesté, avec le consentement du gouverneur général en conseil, ont d'un commun accord consenti à lui soumettre la décision d'un conflit entre les deux pays ou entre des citoyens de l'un et de l'autre. Cette juridiction arbitrale est prévue par l'article X du traité, mais jusqu'à ce jour la Commission n'a jamais été appelée à l'exercer. Quand les membres de la Commission sont également partagés, le traité veut que la question soit jugée par un arbitre choisi conformément à la procédure indiquée par les paragraphes 4, 5 et 6 de l'article 45 de la Convention de La Haye pour le règlement pacifique des conflits internationaux.

ŒUVRE DE LA COMMISSION INTERNATIONALE DEPUIS 1912.

J'ai expliqué à grand traits la triple juridiction que le traité de 1909 confère à la Commission mixte qu'elle a créée. Il convient maintenant de dire comment cette juridiction a été exercée par cette Commission.

Il y a eu plusieurs décisions dans des espèces où on demandait l'autorisation qui est indispensable quand il s'agit de modifier le cours naturel ou le niveau des eaux limitrophes. Je me contenterai ici d'une simple énumération.

Digue à Kettle Falls à la décharge du lac Namakan. Dans cette espèce la Commission a décidé qu'elle n'avait pas juridiction pour accorder la requête, principalement pour la raison qu'il y avait eu, quant à cette digue, législation concurrente dans les deux pays.

Watrous Island Boom. C'était une demande d'approbation de plans pour la construction d'un barrage sur la rivière La Pluie (Rainy River). Cette demande fut accordée sous certaines conditions que je n'ai pas besoin d'expliquer ici.

Construction d'une digue pour fins de pouvoir hydraulique sur la rivière Sainte-Marie au Sault Sainte-Marie. A cause de l'importance de cette rivière et de l'effet possible de la construction d'une digue sur le niveau du lac Supérieur, la Commission fit une étude approfondie de cette question. Elle donna son approbation aux travaux, tout en exigeant certains ouvrages pour empêcher l'élévation excessive

des eaux du lac Supérieur. Elle recommanda la nomination de deux ingénieurs chargés de contrôler l'usage qu'on ferait de la digue, et retint le droit de prescrire à l'avenir ce qui serait nécessaire pour la protection des intérêts de la navigation et des rivages du lac Supérieur.

Demande du Greater Winnipeg Water District pour autorisation de détourner l'eau de Shoal Lake, un lac tributaire du Lac des Bois. C'était un projet de citoyens de Winnipeg qui s'étaient constitués en corporation dans le but de fournir de l'eau à cette ville. Ce projet fut approuvé par la Commission, dont la sanction était nécessaire parce que Shoal Lake, étant tributaire du Lac des Bois, devait être regardé comme une eau limitrophe.

Construction d'une digue sur la rivière Sainte-Croix à Grand Falls dans le Nouveau Brunswick et l'État du Maine. C'est une des décisions les plus récentes de la Commission. Une digue avait été construite sur cette rivière et l'eau en avait été détournée au moyen d'un canal construit du côté américain. On découvrit ensuite que l'on aurait dû obtenir au préalable la sanction de la Commission, et les intéressés présentèrent une requête dans laquelle ils exposèrent qu'ils avaient procédé de bonne foi et dans l'ignorance des dispositions du traité. En conséquence, ils demandèrent l'approbation des travaux tels que construits. La commission crut ne pouvoir autoriser le détournement de la rivière du côté américain que pour un temps limité, et elle n'accorda son approbation que pour le temps pendant lequel on exploiterait le pouvoir d'eau pour l'entreprise actuelle des compagnies propriétaires de cette digue, c'est-à-dire pour les fins de leur moulin de pulpe et de fabrication de papier à Woodland, dans l'État du Maine.

Toutes ces affaires se présentaient à la Commission en vertu des articles III et IV du traité. Mais bien plus importantes, parce qu'elles sont vraiment internationales, sont les questions dont la Commission a été saisie à la demande des deux pays sous l'article IX de ce traité.

Trois questions ont été soumises par les gouvernements des États-Unis et du Canada à la Commission. La première question a été l'objet d'un rapport final. Les deux autres affaires sont encore pendantes.

1. *Le Livingstone Channel.* Il s'agissait de travaux devant faciliter la navigation dans la rivière Détroit. Ce cours d'eau international est l'un des plus importants, bien que des plus courts, de ce continent. La saison de navigation sur cette rivière est de huit mois. Il y passait, en 1912, la quantité énorme de 26,465 vaisseaux, portant approximativement 95,000,000 tonnes de fret d'une valeur d'au-delà de

\$800,000,000, soit plus de trois fois le chiffre du fret transporté, en 1911, par le canal de Suez. On saisit donc facilement l'importance de la question qui fut soumise à la Commission. Celle-ci fit un rapport unanime qui fut adopté par les deux pays.

2. *La question du niveau du Lac des Bois.* Le Lac des Bois est une eau limitrophe au sens que le traité de 1909 donne à cette expression, car il est traversé par la frontière internationale. Ce lac couvre une étendue de 1485 milles carrés; il compte donc parmi les nappes d'eau les plus importantes de ce continent, et il est en outre extrêmement pittoresque, ce qui ne peut manquer d'y attirer un grand nombre de voyageurs. Placé entre l'État du Minnesota au sud, la province d'Ontario à l'est et au nord, et la province du Manitoba à l'ouest, le Lac des Bois est encore un chaînon très notable des voies d'eau navigables qui prennent leur source à peu de distance à l'ouest du lac Supérieur, et qui coulent jusqu'au lac Winnipeg, et de là, jusqu'à la baie d'Hudson en passant par la rivière Nelson. Le Lac des Bois reçoit principalement ses eaux de la rivière La Pluie (Rainy River), qui sert de décharge au lac La Pluie, placé à l'extrémité d'une longue chaîne de lacs qui sont pour la plupart traversés par la frontière entre les deux pays. La décharge des eaux du Lac des Bois se fait par la rivière Winnipeg, qui est la source du Lac Winnipeg. Cette rivière possède, sa chute totale étant de plus de 700 pieds, les pouvoirs d'eau les plus importants de ce continent après ceux de la rivière Niagara.

Il y a une vingtaine d'années environ, on avait endigué les eaux du Lac des Bois à sa décharge à Keewatin et à Kenora. Il en était résulté un exhaussement du niveau de ce lac, ce qui eut pour effet de submerger des terrains considérables sur sa rive sud dans l'État du Minnesota. Les propriétaires de ces terrains s'adressèrent au gouvernement des États-Unis lui demandant de faire des représentations au gouvernement du Canada, afin d'en obtenir le rétablissement du niveau naturel du lac. Des négociations diplomatiques furent entreprises, mais elles n'avaient donné aucun résultat quand le traité de 1909 intervint entre les deux pays, et ce traité avait précisément pour but de régler des différends de ce genre entre le Canada et les États-Unis. De fait, on ne tarda guère à en saisir la Commission internationale.

Dans la lettre que les deux gouvernements adressèrent à la Commission dans le mois de juin 1912, on demanda à celle-ci de s'enquérir des trois questions qui suivent:

1. Afin d'employer le plus avantageusement possible les eaux du Lac des Bois, et celles qui déversent dans ce lac ou qui s'en déchargent, pour les fins domestiques ou sanitaires, pour la navigation et le commerce de transport, pour les pêcheries, et pour les fins de pouvoir

hydraulique et d'irrigation, et aussi afin de faire l'usage le plus profitable des rives et des havres du lac, est-il possible et désirable de maintenir les eaux du lac durant les différentes saisons de l'année à un niveau déterminé, et dans ce cas à quel niveau ?

2. Si le niveau recommandé est plus élevé que le niveau normal ou naturel du lac, jusqu'à quel point les eaux du lac, quand on les maintiendra à ce niveau, submergeront-elles les terrains situés sur sa rive sud ou ailleurs sur ses bords, et quelle est la valeur des terrains qui seront ainsi submergés ?

3. De quelle manière, y compris la construction de digues ou autres travaux à l'entrée ou à la sortie du lac, ou sur les eaux qui lui sont directement ou indirectement tributaires, ou autrement, est-il possible et désirable de réglementer le volume, l'usage et la décharge des eaux du lac, afin de maintenir le niveau recommandé, et quel mode ou arrangement convient-il d'adopter pour assurer la construction et l'opération d'ouvrages de réglementation de ces eaux, ou d'un système ou mode de réglementation, afin de pourvoir à la protection et au développement de tous les intérêts des deux côtés de la frontière, en évitant autant que possible de porter préjudice à tous droits et intérêts, publics et privés, qui pourraient être affectés par le maintien du niveau recommandé ?

La simple lecture de ces questions, que j'ai traduites aussi littéralement que possible, en fait saisir l'importance et l'extrême difficulté. Il a d'abord fallu faire faire, par des ingénieurs nommés par la Commission, un relevé complet du Lac des Bois et de ses principaux affluents. Ensuite la Commission à plusieurs reprises a entendu les intéressés et les témoins produits par eux. Finalement, le mois dernier à Washington, ont eu lieu les plaidoiries des avocats des gouvernements et des compagnies et groupes de citoyens dont les intérêts sont engagés dans le débat. Cette enquête, en y comprenant les rapports des ingénieurs, forme actuellement au moins sept volumes imprimés et un album de cartes géographiques. Sur tout cela la Commission délibère en ce moment, et elle espère pouvoir bientôt transmettre son rapport et ses recommandations aux deux gouvernements. A n'envisager que les questions de pouvoir hydraulique, qui sont les plus importantes, on peut dire que la décision que la Commission est appelée à rendre aura une portée très considérable sur le développement prochain de cette immense région. Et constatons en passant que la plupart de ces pouvoirs d'eau sont au Canada.

3. *La question de la contamination des eaux limitrophes et des remèdes qu'il convient d'y apporter.* Voilà encore une question qui intéresse au plus haut degré les deux pays.

Le traité de 1909 déclare que les eaux dites limitrophes, aussi celles qui traversent la frontière, ne devront pas être contaminées. De longue date on s'était plaint que ces eaux étaient une source de contagion, car des grandes villes comme Détroit et Buffalo, et des endroits de moindre importance des deux côtés de la frontière, y vident leurs égouts, et il en est résulté de nombreuses épidémies de fièvres typhoïdes et d'autres maladies contagieuses.

Au mois d'août 1912, les deux gouvernements chargèrent la Commission de s'enquérir de deux questions:

1. Cette contamination existe-t-elle et s'étend-t-elle des deux côtés de la frontière?

2. Si oui, quelles mesures convient-il d'adopter pour y porter remède?

La Commission après avoir fait faire une enquête minutieuse a répondu affirmativement à la première question. Elle a constaté un état de choses vraiment déplorable, surtout sur les rivières Détroit et Niagara, et encore, mais à un moindre degré, sur le fleuve Saint-Laurent entre l'État de New York et la province d'Ontario.

Il s'agit maintenant de prescrire des remèdes. Le rapport de l'ingénieur sanitaire consultant vient d'être publié, et les intéressés seront bientôt appelés à discuter devant la Commission les mesures que ce rapport conseille d'adopter.

Moins intéressant, à première vue, que la question du niveau du Lac des Bois, ce problème qui doit recevoir une solution est d'une très grande importance, et il est permis de croire que les mesures que la Commission recommandera seront adoptées ailleurs que sur les eaux de frontière.

Je me contente de mentionner sommairement une autre question internationale dont la Commission a été saisie en vertu de l'article VI du traité, celle du partage des eaux des rivières St-Mary et Milk, ainsi que de leurs affluents, dans le Montana et l'Alberta et le Saskatchewan. Cette question à elle seule exigerait de bien longues explications, ce qui m'entraînerait trop loin. Il s'agit de pourvoir à l'irrigation d'une vaste région très aride, et dans les deux pays les demandes dépassent la quantité d'eau que ces deux rivières peuvent fournir. Le traité veut que le partage soit égal et il a chargé la Commission d'y pourvoir. Si la décision que la Commission adoptera contente tout le monde dans ce conflit d'intérêts divers, ce sera un des plus beaux triomphes de l'arbitrage international.

Il me reste maintenant bien peu de choses à dire sur le travail accompli par la Commission depuis qu'elle a été constituée. Mais je dois au moins signaler un fait assez remarquable, étant donné qu'une commission de ce genre est composée de citoyens des deux pays

qui plaident souvent l'un contre l'autre. Jusqu'à ce jour les décisions de la Commission internationale ont été ou bien unanimes, ou bien elles ont été rendues par une majorité de ses membres, sans que le point de vue purement national ait influé sur les suffrages. Le traité a bien pourvu à l'éventualité d'un partage égal de voix, mais cette éventualité ne s'est pas encore présentée. Rien ne serait plus nuisible à cet essai d'arbitrage international que de s'avouer incapable de résoudre une difficulté, parce qu'on voudrait faire triompher quand même les intérêts de son pays. Les membres de la Commission ne doivent pas oublier qu'ils font partie d'une cour suprême des États-Unis et du Canada, et l'honneur de contribuer, par l'esprit d'équité et de justice qui doit dicter leurs décisions, à maintenir la bonne entente et l'harmonie entre deux grandes nations, vaut bien le sacrifice —et il faut le faire courageusement—de l'esprit de parti et du sentiment de clocher, qui n'ont assurément pas de place dans leurs délibérations.

En ces temps de guerre presque mondiale, on peut dire que l'Angleterre et les États-Unis ne pourraient mieux célébrer leur centenaire de la paix, qu'en offrant au monde entier cet exemple de règlement pacifique de conflits internationaux. Et quand on discutera les conditions du traité de paix qui mettra fin à cette guerre, espérons-le, le principe de l'arbitrage international sera unanimement reconnu comme la seule solution possible quand il s'agira de nouvelles difficultés entre nations. Si le traité de 1909 peut servir de modèle à d'autres traités d'arbitrage, le bien qui en résultera pour l'humanité sera la plus grande récompense de ceux qui ont négocié ce traité, comme de ceux à qui il a été donné de siéger sur la Commission qu'il a créée.

Transactions of The Royal Society of Canada

SECTION II

SERIES III

JUNE 1916

VOL. X

The Economic Effect of War upon Canada

Presidential Address by DR. ADAM SHORTT, C.M.G.

(Read May Meeting, 1916.)

The accepted economic principles and practical deductions, until quite recent times, were, very naturally, founded upon European experience and policy. At the same time, those who observed conditions in other portions of the world, particularly those parts with which the European nations were brought in contact, either through colonial enterprise or foreign trade, were often seriously puzzled on finding that the most widely accepted principles under European conditions were apt to work in quite erratic and even unreasonable ways in other parts of the world. Thus, even the astutest advocates of the navigation laws and other restrictions upon freedom of trade and shipping, were constrained to admit that, in America at least, the chief basis of European profits from colonial and foreign trade were dependent upon a systematic violation of all these drastic measures. Sir Joshua Child, one of the prominent members of the East India Company, having an intimate practical knowledge of the early colonial and foreign trade of Britain, while strongly advocating the usual orthodox faith in the wisdom of the navigation laws and the monopoly of colonial trade, yet was forced to admit, as the result of his practical experience, that the prosperity of the British American colonies and the enormous wealth which they brought to the mother country, were mainly due to the systematic violation of these laws and that policy. Hence, as he says, while outwardly and in theory supporting the existing law and policy, yet quietly and in practice, the Government should put the telescope to its blind eye when considering the actual manner in which the riches brought from the American colonies have been acquired, and should not exhibit any zeal in enforcing beyond the Atlantic the accepted navigation and colonial laws.

In France, however, the government of the colonial possessions was administered much more thoroughly and maintained a rigid

enforcement of the orthodox European policy of the period. As a result, the French colonies developed but slowly during the periods of peace and were subject to the most varied and uncertain fortunes during war. During the earlier stages of war, however, the French colonies of Canada, Acadia, and Isle Royale, or Cape Breton, usually enjoyed exceptional prosperity. During war the customary policy pursued in times of peace had often to be reversed, and regions from which revenue was sought to be extracted might become, during war, the centres of extensive expenditure.

During the French régime, Canada normally suffered from inadequate development, the French Government being as a rule too eager to reap abundantly where it had sown but scantily. It, therefore, entrusted to monopolistic trade corporations the task of exploiting the country, in order that the Government might, on the one hand, avoid the expense of developing the colonies, while, on the other, seeking to tax the companies upon their anticipated profits due to the exclusive monopoly of colonial trade and shipping which had been granted to them. The effect upon the French North American colonies of the chronic condition of warfare which characterized the relations between Britain and France during the greater part of the eighteenth century, was somewhat varied. During the period of active hostilities in the interior of the continent, the Canadian population suffered in two ways, first and chiefly in being dragged from their homes to serve either as soldiers in the field or as workmen and portageurs under the odious *Corvé* system of forced labour, and secondly, in the neglect of their farms and domestic industries, which meant the serious retarding of the development of the country.

In so far, however, as the warfare was chiefly confined to a struggle upon the high seas and the maintenance of a condition of well equipped preparedness on land, the Canadian colony usually found the situation to its immediate advantage, although commonly to its ultimate loss through the very waste of national resources, from the fragments of which the temporary prosperity was derived. During the period from 1735 to the first fall of Louisburg in 1745, while Canada was maintained on a basis of fair equipment, there was little serious warfare in the inland regions. The purchase by the Home Government of considerable supplies to be used within the country contributed greatly to the economic advantage of the colony as a whole. Even more advantageous, however, was the great business in the imports and exports carried on through the rapidly developing port of Louisburg. The significance of this important centre in the prolonged Anglo-French struggle was due to the fact that it furnished a very

natural and convenient meeting point for the traffic in exports from France to the American colonies—Canada and the West Indies. It was also convenient for the purchase and exchange of sugar, molasses, rum, and other West Indian produce and the peltry, grain, cattle, fish, timber, and coal, from Canada and Cape Breton. At the same time, it furnished an excellent harbour and naval base, not only for the commercial shipping which centred there, but for the warships of France in their eternal conflict with the British Navy and their equally constant raids upon British commerce. Provisioned and equipped at Louisburg, the French war vessels sallied forth to prey upon the numerous fishing and trading vessels of the British American colonies passing too and fro between Boston and other New England ports and the fishing banks off Nova Scotia and Newfoundland, or upon the larger vessels carrying rich cargoes of miscellaneous merchandise between the ports of Britain and those of her American colonies from Nova Scotia to the West Indies. When, however, the French men-of-war sighted a superior British force, they found a safe refuge in Louisburg Harbour under the protection of its formidable fortifications. To Louisburg, also, were brought the numerous prizes which were captured in that neighborhood.

Under normal conditions, the Canadian merchants could export, at heavy charges only a limited number of native products, chiefly furs, to the ports of France and obtain thence under equally heavy charges a meagre supply of manufactured goods. But, under the conditions of warfare just indicated, they found at Louisburg, within reach of their own small-vessels and fishing craft, an ample market for every possible line of provisions and naval stores, while there too they obtained, at exceptionally low rates, a great variety of manufactured goods, largely taken from British prizes brought into that port. Little wonder then that for the five years of active maritime warfare between 1740 and the first capture of Louisburg by the British colonial forces from Boston, Canada enjoyed a period of exceptional prosperity and the novel experience of exchanges regularly in her favour. The changed conditions for Canada resulting from the loss of Louisburg may be illustrated from the single fact that before its capture Canadian flour was selling at ten to twelve livres per quintal (108 lbs.), while after the capture, the price fell to six to seven livres.

With the Treaty of Aix-la-Chapelle in 1745, Cape Breton and Louisburg were once more restored to France, to the intense chagrin of the American colonies and the corresponding joy of the Canadian and other French possessions in America. Although for a time there was nominally peace between France and England in Europe, there was bitter rivalry and but thinly veiled war between their possessions in

America. Both sides recognized that active hostilities were again inevitable and made their preparations accordingly. Louisburg once more became the great French centre of trade and of piracy until the latter was dignified by the name of war, on the formal declaration of hostilities in Europe.

During the period before and during the final struggle for supremacy in America, the normal trade of the country was obliterated in the great local demands for soldiers, labourers, and supplies of every kind requisitioned or purchased for the Imperial Service. But for the extent to which Canada, in the latter period of the struggle, became the theatre of war, the situation should not have been very different from that which prevailed during the war of 1812.

The French Government was spending vast sums in the colony. The prices charged to the Government were abnormally high, but, in the first place, such prices were seldom paid in anything but paper, while the supplies being requisitioned by the Intendant at arbitrarily fixed prices, the chief profits were taken by the notorious Bigot and his agents. The paper money in which the habitants were paid for their services and supplies from 1756 onward, while practically the same in form and operation as the army bills afterwards issued by the British Government during the war of 1812, differed from the latter in the simple but essential feature of not being promptly redeemed in specie or bills of exchange, in fact, in most cases, in not being redeemed at all. Thus, in the final conflict in Canada, what would normally have been a period of considerable, if not great prosperity to the inhabitants, not directly in the theatre of war, turned out to be a period of exceptional distress and disaster. It is, perhaps, worth observing that the argument advanced by Bigot for an almost exclusive use of paper money in the purchase of supplies of all kinds from Canada, was practically the same as that advanced by the German financiers of the present time, namely that it promotes the loyalty and devotion of the people to the monarch, inasmuch as should he lose, the people are not likely to realize much on their paper wealth. The sequel proved the argument to be perfectly sound in the case of Canada. "Gorged with money and dying of hunger" is Bigot's illuminating phrase in description of the condition of the Canadian people during the last months of French rule.

The chief economic sequel to the peace which transferred Canada from France to England, was a very marked improvement in the condition of the common people, but considerable distress on the part of the Seigneurs, including the military and official classes, so far as they remained in the country. Though the market for the products of the country was not so good as during the period of war, yet the prices

given were quite acceptable and what was of much greater importance to the habitants, was the fact that they were paid in metallic money, which, in turn, was able to purchase the necessary imported goods at fairly moderate rates. The official classes, however, had little to dispose of but their services. To furnish them with suitable employment, a continuation of the system of lavish issues of paper money, to be redeemed by the British Government, in support of a large military and official establishment was strongly urged by the noblesse and heartily supported by the British Officers in command of the colony.

The rising difficulties between the Home Government and the older English colonies to the south gave practical point to the urgent recommendations of the Canadian Governors. This ultimately resulted in the larger measure of the Quebec Act, intended to restore Canada to the position of an exclusively French and Indian territory to be utilized for the purpose of keeping the English colonies in due subjection to the British Government. The purpose of this measure being fully recognized, alike in Britain and America, together with the other American legislation of the year 1774 and the consequent action taken on both sides, precluded the possibility of reconciliation and the American Revolutionary War was definitely entered upon.

The body of the French-Canadian people resolutely refused to respond to the call to arms on the part of the Governor, the noblesse and the Church, representing the restored feudal authority in Canada. Instead of Canada proving one of the chief agencies by which the American colonies were to be brought to heel, Canada itself was almost lost through a small and poorly equipped colonial invasion before the hastily summoned British troops from England could arrive. The necessity to garrison Canada instead of utilizing it as an ally against the colonies, and other important miscalculations of Governor Carleton and his Canadian officials had a very material effect upon the ultimate outcome of the Revolution. Economically, however, the effect upon Canada was very beneficial, for, though the Canadians would not fight for Britain, they were eager enough to furnish supplies for the British armies when a local market was furnished at war prices. The result was that, protected from further invasion by American armies, the French-Canadians enjoyed a period of exceptional prosperity from 1776 to the close of the Revolutionary War in 1783. Even after peace was restored, the disillusionment which the British authorities had received was so complete that for over half a century to come Britain maintained in Canada, at her own expense, very considerable garrisons, the supplies for which were mainly obtained in the country and paid for in cash. This outlay was further augmented by the con-

struction, at the expense of the Imperial Government, of many fortifications and other public works in aid of transportation, all of which were charged to the military chest. This expenditure furnished most of the ready money to be found in the various British North American provinces.

Speaking of the continuation of the military expenditure after the close of the Revolutionary War, the Honourable Richard Cartwright, identified with so much of the early international commerce of the Canadas, thus described the situation in a letter to his personal and business friend, Mr. Isaac Todd, of Montreal, in 1792, "To what is to be ascribed the present state of the improvement and population of this country? Certainly not to its natural advantages, but to the liberality which the Government has shown towards the Loyalists who first settled it; to the money spent by the numerous garrisons and public departments established amongst us; and the demand for our produce which so many unproductive consumers occasion on the spot. As long as the British Government shall think proper to hire people to come over to eat our flour, we shall go on very well, and continue to make a figure, but when once we come to export our produce, the disadvantages of our remote, inland situation will operate in their full force, and the very large portion of the price of our produce that must be absorbed by the expense of transporting it to a place of exportation, and the enhanced value that the same cause must add to every article of European manufacture will give an effective check to the improvement of the country beyond a certain extent."

Cartwright's prediction was duly fulfilled. As the western settlements in particular expanded during the first decade of the nineteenth century, it became increasingly difficult to profitably dispose of an augmenting proportion of their products, which had to find a market beyond the borders of the country. Direct trade with the West Indies had not been developed and the peculiarly erratic operation of the Corn Laws rendered the British markets most uncertain for the disposal of Canadian grain—the chief surplus product of the country. The long delay involved in obtaining information as to the condition of the British market and the still longer time involved in transporting the products thither and receiving returns, rendered the export trade to the Mother Country a very speculative one. Prices, therefore, fell steadily in Canada and ready money was increasingly difficult to procure. For some years before the outbreak of the War of 1812, the Canadian merchants were compelled to sell their goods on long credits and almost invariably to accept farm produce in exchange, the returns for which were often not made for a couple of years. Thus, frequently three or four years elapsed between the sale of imported

goods and the obtaining of ultimate payment for them. Naturally, as Cartwright forecasted, the prices for imports were high and the returns for native products were low. As a result, just before the outbreak of the War of 1812, Canadian retail merchants and farmers found themselves heavily in debt to the wholesale merchants, while they, in turn, were under constant pressure from their creditors in Britain and elsewhere.

The outbreak of the war with the United States soon changed the whole economic aspect of the country. Once more an extensive cash market was established in Canada. No longer did the only saleable staples consist of wheat, timber, and potash. Every form of food and military supplies found a local market from Quebec to Detroit at war prices. Transportation of every kind and all forms of service for man and beast of burden were in constant demand at rates not dreamt of for many years. Payments were at first made in cash, but it was difficult and risky to make such payments throughout the wilderness of Upper Canada. Moreover, beyond the limited local needs of the farmers and villagers, the holding of metallic currency was an embarrassment to the settlers. The famous "army bills" were, therefore, devised to meet the peculiar needs of both army contractors and the inhabitants. Once it was found that these bills were freely accepted by the local and wholesale merchants, who, in turn, found them promptly met in cash or bills of exchange on Britain, they were readily welcomed by the settlers, especially in the cities and the British settlements of Upper Canada, and the volume issued rapidly developed. The effect on trade was marvelous. Everything was saleable. Prices were high and yet everyone had money with which to buy. Long outstanding debts were being paid off in every direction and the wholesale merchants found money pouring in upon them in unprecedented volume. Numerous fortunes, large for those days, were amassed in York, Kingston, Montreal, and Quebec. Naturally, under so rapid a change from hard times and penurious living to prosperity and ready money, extravagance, luxury, and dissipation soon manifested themselves and, once established, did not disappear with the close of the war, which involved an immediate curtailment of British expenditure in the colony.

The exchanges, which from 1813 to 1815 had been heavily in favour of Canada, soon passed to the other extreme on account of the great consumption of high priced foreign luxuries, many of which were imported, especially to Western Canada, through the United States. In consequence, the surplus Canadian cash passed rapidly to the United States, and within eighteen months of the close of the war the less provident elements of the population, who had imagined that an

economic millenium for Canada had arrived to remain, found, to their chagrin, that ready money and ready employment had alike vanished. The reaction was rapid and severe and the colony once more entered upon a prolonged period of stagnant markets, low prices and little demand for casual labour. This condition of affairs continued for ten years, from 1816. During this period of stagnation, the war era of 1812 to 1815 was universally referred to as a phase of economic golden age for the return of which most Canadians were understood to devoutly pray.

With the revival of prosperity in Britain and the recovery of the continent of Europe from the devastation of the Napoleonic Wars, there developed, on the one hand, improved markets for the Canadian produce and, on the other, a certain readiness on the part of the Home Government to undertake more extensive public works in Canada, chief of which was the Rideau Canal undertaken on military grounds. Minor works were also planned, most of them for what were then deemed imperial needs, but some to furnish employment for the rapidly increasing numbers of immigrants coming to Canada, partly on their own initiative and partly through the assistance furnished by the Home Government. This prosperous period, beginning in 1826 and culminating in 1832, was followed by a time of reaction and political conflict with the representatives of the Home Government. This culminated in an actual and fairly wide-spread revolution in Lower Canada and a more or less grotesque parody of it in Upper Canada. This was followed by the reunion of the Canadas under the seductive inducement of very large grants for public works, especially the development of the St. Lawrence system of canals.

Although the revolutionary outbreaks on the continent of Europe in 1848 seriously interfered with trade for a time, yet they did not involve Western Europe in warfare nor directly affect Great Britain and her colonies. Canada, however, had her own touch of revolutionary upheaval during the stormy year of 1848 in the shape of riots over the indemnification of those who claimed to have suffered losses through the rebellion in Lower Canada. This was followed by the annexation manifesto of 1849, when economic conditions, especially in the towns and cities, were at a low ebb. Again, however, British capital and British diplomacy came to the rescue in furnishing many millions for railroad undertakings, in securing the Reciprocity Treaty with the United States, and finally, though this was not part of the original programme for restoring prosperity and contentment, in bringing about the Crimean War. Wheat was already over a dollar per bushel when the war broke out in the spring of 1854, and it did not fall below that point again until the war was over and with it the usual

artificial but short-lived boom which follows the close of most wars. Although Canada was blessed with several good harvests between 1853 and 1856, yet the volume of her grain was not sufficient to materially affect prices, especially in the face of the shutting off of the usual Russian supplies. There was answered in every particular, therefore, the alleged fervent prayer of the Canadian farmers for "a bountiful harvest and a bloody war." In the upward sweep of prices, wheat actually reached the high water mark of two dollars and fifty cents per bushel. What this meant for an agricultural country can be easily understood. Details of this situation, however, have already been dealt with in a previous paper.

The reaction after this exceptional period of prosperity was correspondingly severe. The fragments of exploded land speculations filled the air. Commercial failures were numerous and the Government was swamped by its railroad obligations. Financially, the credit of the country fell to the lowest point in the history of Canada. Once more, however, war came to the rescue, this time on the American continent in the shape of the Civil War between the Northern and Southern States. The Trent Affair during the earlier stages of the conflict and the Fenian Raids at the close of it occasioned the sending of special British troops to Canada, although, of course, not on a scale relatively so important as in the cases of the earlier American conflicts. The chief economic benefits to Canada, however, resulted from the excellent markets for Canadian supplies, furnished by the armies of the North, and the inflow of Southern funds for safe-keeping in Canadian banks. The latter furnished temporary trading capital of great assistance at a time when little was to be had in Britain. One serious drawback to the American markets was the amount of depreciated paper money which had been issued even by the Northern States and which, as legal tender, had almost completely taken the place of metallic currency. At the close of the war, the Reciprocity Treaty was abrogated in 1866, yet the usual post-bellum boom being in full cry, aided by the resurrected metallic currency, which had been in hiding during the war, resulted in an augmented demand for Canadian produce at Crimean prices in hard cash. Of course, the American boom soon collapsed and stagnation and pessimism reigned in the Spanish castles erected by feverish speculators and optimists. Naturally, Canada suffered somewhat from the reaction, but not so severely as the United States. The financial stringency in Europe, marked by the Overend failure, being relieved, was followed by the outbreak of the Franco-Prussian War, which once more brought prosperity to Canada, not so much directly through the influence on British trade and industry. The boom, which followed in the wake of that brief but tragic struggle, was felt

in Canada more in financial and trading lines than in agricultural prosperity. The period of collapse and stagnation which followed from 1874 to 1879 was correspondingly severe in Canadian urban centres. This was the notable period of the soup kitchens for the unemployed, which, in turn, gave rise to the National Policy, the consequent overthrow of the McKenzie Government and the introduction of the American protective system.

After a long interval, disturbed only by minor conflicts, chiefly on the borders of civilization, we are now in the throes of a war, incomparably greater than anything which the world has known. The full economic effect upon Canada of this conflict and of its financing, in which Canada, as becomes its modern status in the Empire, is now playing a highly responsible role, cannot be adequately determined at the present stage. So much is already obvious, however, that just before the outbreak of Armageddon, Canada was in a condition of reaction from a prolonged period of exceptional prosperity, largely due, it must be confessed, to the expenditure in the country of hundreds of millions of borrowed capital. How far that reaction might have extended it is now impossible to say, but it is equally obvious that the reaction has been not only arrested but converted into a condition, it may be of temporary, but at least for a time of actual prosperity. The urgent demand for volunteers for overseas service has relieved the country of the threatened problem of unemployment in many urban centres, while the revival of industry in connection with the great variety of army supplies has given ample employment to all the efficient labour remaining in the country. So far, therefore, as actual conditions are concerned, Canada is once more greatly profiting from a share of the thousands of millions being expended by Britain and her allies in the present struggle.

The economic fate of this country during the period of readjustment after peace is too large and too uncertain a subject upon which to enter at the present time. My object has simply been to summarize the effects upon Canada of the chief previous wars, which directly or indirectly have affected her economic condition.

The Refugee Loyalists of Connecticut

By PROFESSOR W. H. SIEBERT of the Ohio State University

PRESENTED BY W. D. LESUEUR, LL.D., F.R.S.C.

(Read May Meeting, 1916.)

Loyalists began to flee from Connecticut to New York and Long Island as early as the summer of 1775 and continued to do so during the next four years. During this period also there were a few flights to Great Britain, Thomas Dare, tide surveyor, and Duncan Stewart, collector of customs, both in the port of New London, departing for England in 1776 and 1777, respectively; while John Saltmarsh of Norwich, glover and dyer, went to Ireland in March, 1779, after spending two years with the British fleet.¹ As most of the Connecticut Loyalists lived in the county of Fairfield, where the Episcopal Church had its strongest hold, it was from this region that the large majority of flights took place, the shore towns of Stamford, Norwalk, Fairfield, and Stratford, contributing notable numbers of refugees.

The vigilance of local committees of safety impelled many Tories to cross Long Island Sound and find shelter within the British lines. The establishment of a post on Lloyd's Neck, opposite the islands and coves lying between Norwalk and Stamford, shortly after the British took possession of New York in September, 1776, was especially advantageous to the Tories of Fairfield County. The inhabitants of the region between the two towns were partly Episcopalians and partly Quakers, all being Loyalists of sufficient devotion to afford asylum and supply passage to those wishing to cross the sound. Walter Bates of Stamford, who was early driven into the mountains and forests for refuge and in the fall of 1778 fled to Long Island, tells us that his "three brothers and hundreds of others passed by night almost continually to the British Garrison" at Lloyd's Neck. Some of the more zealous and influential of these refugees were promptly sent back with commissions, or promises of commissions, to recruit men for the Loyalist corps which began to form at once. Already by the opening days of July, 1776, Stephen Hoit of Norwalk had raised a full company for Brigadier-General Montfort Browne's Prince of Wales American Volunteers, and according to his sworn statement before the Commissioners of Loyalist Claims some years

¹ Sec. Rep., Bur. of Arch., Ont., Pt. II, 1904, 1184, 1156, 1155.

later, he was instrumental in securing over 300 men for this corps alone, having obtained their promises to join before he left home. He claimed also that he had raised 500 others; but the record of his testimony is so brief that we are left in the dark as to the geographical extent of his activities and the names of the regiments which filled their ranks by the secret and dangerous methods of such agents as he. Dr. Joseph Clarke of Stratford also gathered men for the Prince of Wales regiment, thirty-three recruits being the number claimed by him; while the widow of Josiah Wheeler of Fairfield made affirmation that her husband had raised men for a lieutenancy in the same corps, his commission, which she produced, being dated April, 1777.¹ Another inhabitant of Fairfield, Joseph Dickson, identified himself with the Queen's Rangers, a Tory regiment in which his brother was an officer, and for which he secured enlistments, bringing in he tells us "a good many men." Redding, a centre of loyalism lying sixteen or seventeen miles inland, furnished another agent for this corps in the person of John Lyon, who obtained twenty-two recruits for it in Fairfield County under the warrant of Colonel Robert Rogers, as he relates.

A third Loyalist corps which drew a considerable proportion of its men from Connecticut was Colonel Edmund Fanning's King's American Regiment. Fanning was a native of Long Island and a graduate of Yale College who, after serving for some years in an official capacity in North Carolina, came to New York at the commencement of the Revolution. On the arrival of the British troops at the metropolis Fanning proposed to raise a corps of provincials in support of the royal cause, and was aided in his undertaking by liberal subscriptions from the local Tories, those of New York City giving £2,000, while the sum of £500 was subscribed on Staten Island, £310 in King's County, and £219 in the town of Jamaica. Receiving his commission before the end of the year (that is, on December 11), Fanning was busy securing recruits by the following spring, many of these coming from the mainland of Connecticut. We get a suggestion of what was going on in an old document dated at New York, April 27, 1779, which states that Thomas Chapman of Stratford, recruited a number of men for the King's service before he left Connecticut, and brought them off with him early in the spring of 1777. Captain Chapman and his company were carried across the sound to Long Island by the sloop *Gull*, of which John (or Jonathan) Ketchum of Norwalk was the master, and promptly enlisted in the King's American Regiment. Other men who collected Loyalists for this corps were Captain Peter Clements, who lived at the time on the banks of the Hudson and

¹ Sec. Rep., Bur. of Arch., Ont., Pt. I, 1904, 209, 251, 238; Bates, Kingston and The Loyalists of 1783 (pamphlet; St. John, N.B., 1889), 8.

brought 100 followers to New York from his neighborhood, and Captain Isaac Atwood, a New Jersey Tory, who enlisted a troop of Light Dragoons. The recruiting services of another of Fanning's agents ended in the tragedy of an execution for high treason. In 1776 Moses Dunbar of Waterbury, which lies in the northwestern part of the County of New Haven, fled to Long Island. Some months later he was induced to accept a captain's commission at the hands of Colonel Fanning, and while on a visit to Connecticut, for the purpose—according to his own account—of removing his family across the Sound, his presence was divulged to the authorities, and after a period of imprisonment and trial before the Superior Court at Hartford, he was executed, March 19, 1777, not only for enlisting in the service of the enemy, but also for persuading John Adams of Farmington and others to engage in levying war against the state. That the fated Dunbar was not the only citizen of Waterbury who joined the British finds confirmation in the list of 68 names, printed in histories of the town, of those alleged to have left the place for that purpose.¹

There were, of course, others engaged in bringing off their Tory associates and friends, but unfortunately we are not able to identify the regiments that received material additions through their efforts, though we know that an occasional man from Connecticut found his way into Wentworth's Volunteers, Sir John Johnson's second battalion, the Royal Guides and Pioneers, the Loyal American Rangers, and other corps. These were doubtless individual enlistments requiring the labors of no recruiting officer. How many of the following named men carried on their activities under military warrant or what the effect of their labors in swelling regimental rolls is unknown. Daniel Smith of New Milford, Litchfield County, operated under a warrant, or commission, during the winter of 1776-77, and secured "a good many"; John McKee of Norwalk and Benjamin Sealy of Stratford, were caught in the act of spiriting away fugitives, and got themselves into jail by their illtimed efforts; John Cable of Glastonbury, whose vessel on the sound served as tender to the British ship *Swan* (Captain James Ayscough), supplied transportation to Long Island on occasion, while Azariah Pritchard of Derby, operated out of Milford Bay, landing not less than 160 persons on the shores opposite up to May, 1777, when he escaped into Canada. However, Pritchard's activities as an abductor of Loyalists appear not to have ceased with his flight,

¹ Raymond, Winslow Papers, 48, n.; MS. note-book of Rev. W. O. Raymond of St. John, N.B.; Sabine, *Am. Loyalists*, 1847, 281, 282; Rev. W. O. Raymond's "Early Days of Woodstock" in *The Dispatch of Woodstock, N.B.*, Jan. 16, 1907. Bronson, *Hist. of Waterbury, Conn.*; Pond, *Tories of Chippeny Hill*, 56-60; *Conn. Quar.*, IV, 150, 151.

for, after engaging in the secret service on the eastern side of Lake Champlain for several years, he raised a company for Major Robert Rogers' King's Rangers, a corps that was formed in 1781-82.¹

Aside from the numerous flights induced by espionage and persecution and the far larger number due to recruiting, some departures from Connecticut were occasioned by Governor Tryon's incursions in April, 1777, and July, 1779, respectively. On the former of these, the invading force included the Prince of Wales regiment, almost wholly made up of Connecticut men at the time, and had the service of local guides to conduct it from its landing-place at Campo, near Norwalk, to Danbury, where the Americans had collected a magazine of provisions and other supplies. Three of these guides, namely, one Jarvis, Ephraim Deforest of Redding, and Eli Benedict of Danbury, either left with the departing host, or found it advisable to do so shortly after. A fourth one, Isaac Wells Shelton of Stratford, was ordered to confine himself to the County of Hartford, but after a brief season removed to Chippeny Hill. How many Loyalists accompanied Tryon's expedition on its retreat after the burning of Danbury it is impossible to say, but the names of some of these are found in the records of the Commissioners of Loyalist Claims, including Isaac Hoyt and Josiah Benedict of Danbury, Joseph Lyon and Ephraim Tredwell of Fairfield, Benjamin Burt of Ridgefield, Jacob Loder of Stamford, and James Gray, Ensign Samuel Hawley and Israel Rowland of Redding.²

Despite the action of the Assembly in May, 1777, in passing a resolution offering pardon to those who would return to their duty, supplemented by proclamations by Governor Trumbull and General Putnam, Loyalists continued to flee from Connecticut, although some, even of those who had recently departed with Tryon, now gained sufficient courage to return.³ That the movement in the opposite direction had not yet ceased, however, appears from an item in the *Connecticut Courant* of June 6, 1777, noting that a sloop bound to New York had been seized and carried to Fairfield with several Tory passengers on board and adding that thirteen absconding Tories had been found on three other captured vessels. A little over a fortnight

¹ Sec. Rep., Bur. of Archives, Ont., Pt. II, 1904, 867; Pt. I, 209; Pt. II, 873, 909; Pt. I, 349.

² Conn. Quar., IV, 145; Sec. Rep., Bur. of Archives, Ont., Pt. I, 1904, 225, 282, 186, 204; Pt. II, 850; Pt. I, 800; Pt. II, 828; Pond, *Tories of Chippeny Hill*, 73; Grumman, *Rev. Soldiers of Redding, Conn.*, 43, 52, 56, 183, 194.

³ This was true of the three Redding Loyalists, Gray, Hawley, and Rowland, who reappeared after Putnam's proclamation of November 17.

Pub. Records, I, 254; Am. Hist. Rev., Jan., 1899, 289, 285.

later (that is, on June 22), Brigadier-General Montfort Browne wrote from Flushing, L. I., to Muster Master General Edward Winslow that the latter's presence was much wanted at Browne's headquarters in order to muster about eighty or ninety men. He remarked also that it was possible that many more might arrive before Winslow should reach Flushing, as "they only waited for Captain Hoyt's armed sloop." This is probably a reference to Captain Stephen Hoit of Norwalk, the substance of whose affidavit concerning his recruiting activities for the Prince of Wales American Volunteers was given on an earlier page. In the closing paragraph of his letter to Winslow, General Browne applauded the spirited conduct of a company of gentlemen that was on its way to join him (some of whose members had indeed already arrived), because, being persons of good fortune, they had declined "any emolument whatsoever" for the military service they hoped to render. By November 1, 1777, Browne's corps numbered 470 officers and men, and was stationed at Kingsbridge, New York, where it seems to have remained until transferred to Rhode Island, near the middle of June of the following year. During the greater part of the twelve months after this removal its headquarters were at Conanicut, and here it probably continued until the British evacuated Newport in October, 1779. Meantime, the corps had shrunk considerably from the number shown in its first enrollment. By the muster of February 24 (1779), we find that it had dwindled to the extent of more than 100 men.¹ Inasmuch as the filling of the Prince of Wales regiment is said to have drawn heavily upon the male population of Redding, as doubtless on that of other Loyalist centres in western Connecticut, it is interesting to note in this connection that the selectmen of Redding reported in February, 1778, that forty-nine Tories in that town had "gone over to the enemy."²

Like the Prince of Wales Volunteers, Fanning's King's American Regiment was at Kingsbridge, November 1, 1777, when it numbered 481 men, its maximum strength of 517 being reached nearly six months later. It was sent to Rhode Island, doubtless along with Browne's corps, but was stationed at Newport and maintained its strength while there at about 480 men. On June 16, 1779, it sailed for New York, and accompanied Tryon's last expedition to Connecticut, which occurred in the early days of the next month. This expedition was directed against New Haven, Fairfield, Green's Farms and Norwalk, and like the earlier one, was piloted by tory guides, William and

¹ MS. Note-book of Archdeacon W. O. Raymond of St. John, N.B.; Raymond, Winslow Papers, Montfort Browne to Edward Winslow, June 18, 1778.

² Am. Hist. Rev., Jan., 1899, 278.

Thomas Chandler, sons of Joshua Chandler of New Haven, two brothers of Amos Botsford of the same town, and Daniel Smith of New Milford, serving in this capacity.¹ According to a tradition, which carries all of the distinguishing marks of truth, and which one would like to believe to be true, it was the intercession of Colonel Fanning, who had evidently not forgotten his college days in New Haven, that induced Tryon to withhold the torch from the town. It is, at any rate, a striking fact that the other places visited by the enemy did not escape consignment to the flames. At the same time, it must be remarked that the known loyalty of some of the inhabitants of the college town did not save them from abuse at the hands of the King's troops. This fact may help to explain the slight response on the part of New Haven Tories to the proclamation of Tryon and his naval colleague, Sir George Collier, in offering a refuge to the inhabitants of Connecticut "against the distress which . . . broods over all your country." The only families that left the town with the British, so far as can be learned, were those of Joshua Chandler and Amos Botsford (both barristers), and, that of Captain Abiather Camp (a merchant), while either then or soon after one Ogden and his family, who kept a coffee house, were compelled to depart, on account of the unpopularity they had achieved by their entertainment of British soldiers.²

When Tryon and his men reached Norwalk, they were re-enforced by a considerable body of Loyalists, who returned with the expedition to New York, some with their families, including the Rev. John Sayre of Fairfield, the Rev. Jeremiah Leaming, D.D., of Norwalk, and Jonathan Ketchum, a tavern-keeper of the same place, together with the latter's son, Samuel, and his household.³

In numerous instances throughout the period of flight, fugitives could not thus take their wives and children with them; but the authorities were not averse as a rule to granting liberty to those left behind to follow husbands and fathers within the British lines. For example, the families of Nicholas Brown of Hartford, Asa Church of Danbury, and Azariah Pritchard of Derby received such permission

¹ MS. Note-book of Archdeacon W. O. Raymond, St. John, N.B.; Townshend, *Brit. Invasion of New Haven, Conn.*, 92-94; *Sec. Rep., Bur. of Archives, Ont.*, Pt. II, 1904, 785, 867.

² Townshend, *Brit. Invasion of New Haven, Conn.*, 24; *Papers of New Haven Colony Hist. Soc.*, II, 52, 53, 59, 64, 79, 87; *Sec. Rep., Bur. of Archives, Pt. I*, 1904, 80; Pt. II, 785; *Rev. Characters of New Haven*, 36.

³ *Conn. Quar.*, IV, 257, 261, *Am. Hist. Rev.*, Jan., 1899, 290; Townshend, *Brit. Invasion of New Haven, Conn.*, 42; *Sec. Rep., Bur. of Archives, Ont.*, Pt. I, 1904, 230, 231, 283.

shortly after the disappearance of their respective heads. In the case of the family of Ebenezer Punderson, a merchant of Norwich, Conn., who had found it necessary to flee at the close of May, 1775, (first, aboard the ship *Rose* at Newport, where he sojourned four months, then to Boston and so to London for the winter, returning to New York in the spring) an interval of three and a half years elapsed before the members of this dissevered household were able to reunite.¹

When the tide of war moved to the southward in 1780, the Prince of Wales American Volunteers and the King's American Regiment together with other Loyalist corps, moved with it. The Prince of Wales Volunteers saw service in South Carolina during nearly two years, beginning with September 1st of the year named, its last muster in the South being held on James Island, June 24, 1782, when the regiment numbered 267 men. The King's American Regiment was sent with General Leslie in October, 1780, to the relief of Lord Cornwallis, and consisted at the time of eight companies of infantry, one of light infantry, and one troop of light dragoons, the total strength being over 450 men. After participating in several battles in South Carolina, the corps proceeded to Savannah, Georgia, where it remained in garrison until the summer of 1782, when it returned to New York, and encamped at Flushing, Long Island, until the close of the war. The last muster of the regiment before its departure for the Bay of Fundy (this muster taking place in August, 1783), shows that it had dwindled to nearly half of its maximum strength, or to an enrollment of 273 of all ranks—a loss of 130 members since its final muster at Savannah fourteen months before.²

Concerning the Queen's Rangers, which contained a large proportion of Connecticut men at the beginning of its career, much more requires to be said in order to trace its component elements. This corps was raised by Colonel Robert Rogers of Dunbarton, N.H., who appears to have openly espoused the royal side early in 1776. His recruiting operations were carried on "in Connecticut and the vicinity of New York," and he encouraged enlistments by issuing a printed

¹ Mr. Punderson's Narrative, Westminster, 1780, 8-10.

Capt. Abraham De Peyster and his Grenadier Company of the King's American Regiment had participated in the unsuccessful expedition from Newport against New Bedford, Conn., and Falmouth, Mass., at the end of March, 1779, and in the second attempt on New Bedford on May 14. Just what share it may have had in the capture of various prizes, besides a large number of farm animals in the following June and September, we do not know. (MS. Note-book of Archdeacon W. O. Raymond of St. John, N.B.; Raymond, Winslow Papers, 46, 47.)

² Rev. W. O. Raymond's "Early Days of Woodstock," in the Dispatch of Woodstock, N.B., Jan. 23, 1907; MS. abstracts of Col. Edward Winslow's Muster Rolls, by Rev. W. O. Raymond.

circular in which he promised the prospective members of his command "their proportion of all rebel lands, etc." The first muster of the corps was held on Staten Island in August, 1776, by Colonel Edward Winslow. For a while Rogers and his regiment were stationed at an outpost near Marroneck, the strength of the organization attaining a maximum of over 400 men under its first commander, but hardships and neglect greatly reduced this number towards the end of the year and Rogers left for England, apparently on sick leave. The command now passed to Colonel French, and soon after to Major James Weymyss, who resigned in the middle of October, 1777, when John Graves Simcoe, formerly captain of the grenadier company of the 40th Regiment, became major commandant by Sir William Howe's appointment.¹

At this time the Queen's Rangers were encamped with the British army at Germantown, Pennsylvania. A few days after the arrival of the army in Philadelphia, the Rangers, according to Simcoe, were "augmented with nearly an hundred men who had been enlisted by Capt. (John Ferdinand Dalziel) Smyth during the various marches from the landing of the army in the Chesapeake to this period" (October 23). The actual number of this accession is shown by the Muster Rolls to have been 61 men, besides Smyth and Lieutenant James Murray. On November 1st, the corps was again mustered, when it numbered 384 men. Considerable changes were also effected at this time in the list of officers, the earlier ones being superseded by "many gentlemen of the Southern colonies who had joined Lord Dunmore and distinguished themselves under his orders." The regiment profited also by the addition of some volunteers from the army itself. The accession of Captain Smyth's company increased the regiment to eleven companies, which were now equalized by distributing Smyth's men among the others, while the eleventh was formed of Highlanders including several Scotchmen from North Carolina. Toward the end of 1777 the mounted men in the regiment were organized into a troop of Hussars, which in the following February numbered 30. The muster at the close of the previous December showed a total of 533 officers and men in the corps, or an increase of at least 222 since the arrival of Simcoe and his men in Philadelphia. This notable increase was in part attributed by the commander to "a very great desertion from Washington's army this winter." That Simcoe's own force suffered severely during the months immediately following, whether from casualties or desertion, is indicated by his statement that in March (1778) it consisted only of "about 270, rank and file, and 30 cavalry."

¹ Sabine, *Am. Loyalists*, 1847, 576, 578; Simcoe's *Journal*, 1843, 18, vii; Rev. W. O. Raymond's *Note-book* (unpublished).

However, this decrease was largely offset by the support given the Queen's Rangers by Captain Thomas Sandford and his troop of Bucks County Light Dragoons, who at this time "considered themselves under Lieutenant Colonel Simcoe's protection," and by the co-operation between Simcoe's regiment and another local troop of provincials, the Philadelphia Light Dragoons, numbering over 100 men led by Captain Richard Hovenden and Captain Jacob James.¹

On the evacuation of Philadelphia by the British the Queen's Rangers crossed at Cooper's Ferry, June 17, 1778, and by the time they reached Allentown were accompanied by many refugees, who, Simcoe says, served him as guides. On July 5th, the corps was transported from Sandy Hook to New York, and Simcoe boasts that it had experienced no desertions during the march across New Jersey. Ten days later it encamped near Kingsbridge, and here its numbers mounted again by the accession of the troops of Hovenden, James, and Sandford. Hence, the muster of August 24, which was taken at Kingsbridge, shows the strength of the corps as 448 men, among whom undoubtedly the Connecticut Loyalists formed a much smaller proportion than at the beginning. Although about three weeks before the muster, Hovenden and James' troop (the Philadelphia Light Dragoons) was transferred to the British Legion, Simcoe remained in command of the cavalry of that organization for the time being, and in command also of Lieutenant Austrias Emerick's corps of Chasseurs, which was in a great measure composed of Loyalists. On November 19th the Queen's Rangers went into winter quarters at Oyster Bay. It was evidently at this time that an effort was made to augment the troop of Hussars to a membership of 50 or more, for the officers of the Rangers subscribed liberally to a recruiting fund, and an advertisement was inserted in Rivington's *Royal Gazette* offering a bounty of forty guineas each to "all aspiring heroes" who would join the troop, and of two guineas to any person bringing in a recruit to Cornet Spencer at No. 1033 Water Street, or at Hewitt's tavern, New York.²

At the muster of February 24, 1779, the regiment numbered 449 men, but when it left Oyster Bay to return to Kingsbridge, May 18, its enrollment had fallen to "360 rank and file," according to Simcoe, evidently through its activities in New Jersey. Early in August Captain Frederick de Diemar's troop of German Hussars was added to the corps, while the Bucks County Light Dragoons were continued as a part of Simcoe's command "until further orders." The corps

¹ Simcoe's Journal, 17, 18, 20, 32, 37, 47, 55, 58, 153, 156; MS. Muster Rolls of Col. Edward Winslow (in possession of the N. B. Hist. Soc., St. John, N. B.); Abstracts from the Muster Rolls by Rev. W. O. Raymond (unpublished).

² Simcoe's Journal, 62, 66, 74, 76, 79, 80, 96, vii, viii.

was strengthened again in the middle of January, 1780, by the addition of "a great many recruits," who deserted from an American force that invaded Staten Island from the Jerseys under Lord Sterling. Some of these deserters, Simcoe tells us, had enlisted with the enemy in order to free themselves from imprisonment, and now embraced the opportunity to return to their old companions. The result of these accessions is apparent in the next muster, which was held on Staten Island, March 24, and showed an enrollment of 595 men.¹

Early in April the Rangers' infantry sailed, along with the Hessian regiment of Ditforth, the Volunteers of Ireland, and the Prince of Wales American Volunteers, to join the British before Charleston, South Carolina. It arrived at its destination, April 21, numbering 400 rank and file. After the surrender of Charleston to the King's troops it re-embarked for Richmond Redoubts on Staten Island, reaching its quarters, June 21. In the course of the next month it was joined by the Hussars and a hundred more of its cavalry, and then (August 23) proceeded once more to Oyster Bay, where it was augmented by three troops of Dragoons under the command of Captains John Saunders, David Shank, and Thomas Joseph Cooke. These troops, together with the Hussars (now increased to seventy-eight men), the German Hussars, and the Bucks County Light Dragoons, are all included in the muster of August 24, which shows their combined membership to have been at that time 288 men, while the strength of the eleven infantry companies was 501 men, and the number of officers was eighty-five, making a total of 874.

On October 8, Captain Saunders' troop, which numbered only sixteen men, was detached to accompany General Leslie to Virginia, of which Saunders was a native, and where he expected to complete his company. Two and a half months later this detachment was followed by Simcoe and the Rangers on an expedition to the same state under Arnold's command, but Captain Cooke was permitted to remain in New York to fill the ranks of his Dragoons. The hardships of this expedition told heavily on Simcoe and his men, so much so, in fact, that by the early days of June, 1781, the corps had "scarcely more than 200 infantry and 100 cavalry fit for duty," and Lord Cornwallis found it necessary to order Captain Hutchinson and the 71st Regiment (200 rank and file) to join Simcoe. At the capitulation of Yorktown, October 19, ten infantry companies and three troops of cavalry of the Rangers were involved. A muster taken two months later showed 282 members of the corps, besides officers, detained in the victors' camps at Frederickstown, Fredericksburg, Winchester, and

¹ MS. Muster Rolls of Col. Edward Winslow; Abstracts from the Muster Rolls by Rev. W. O. Raymond; Simcoe's Journal, 100, 107, 121, 128.

Little York, Virginia.¹ By one of the articles of surrender the *Bonetta* ship-of-war had been left at the disposal of Cornwallis, who sent Colonel Simcoe aboard and with him as many Rangers and men of other Loyalist corps of those remaining within the lines as the vessel could hold. On their arrival at New York, Sir Henry Clinton permitted Simcoe to sail for England, while the part of the regiment that had come in the *Bonetta* was placed under the command of Captain Saunders, who had just returned from Charleston. Of those held as prisoners in the South a large number soon escaped, and made their way safely to New York. At a muster of February 24, 1782, the infantry of the Queen's Rangers was credited with 342 persons, the cavalry with 236, or together 578. That these figures included the women and children is shown by the authorization issued to Colonel Edward Winslow, April 15, 1783, by Major R. Armstrong of the corps to obtain grants and locate lands in Nova Scotia for the Rangers, agreeable to a return, or enumeration, of 575 persons, of whom 305 were privates, sixty, women, and seventy, children. However, according to the muster held only nine days later (April 24), the total number had dropped to 448, 280 of these being connected with the infantry and 168 with the cavalry.² The sudden decline in numbers of the Queen's Rangers and the King's American Regiment before the Loyalist corps left New York for Nova Scotia was due to the fact that those who preferred to take their discharge and run the risk of remaining in the States were permitted to do so, while many of the officers hastened to England, once hostilities had ceased, to urge their claims for half-pay and seek compensation from the government for their losses in the war. It need scarcely be added that numerous American provincial regiments experienced similar drops in numbers.

Meantime, a community of refugees chiefly from Connecticut, but with smaller groups from Rhode Island, Massachusetts, and Dutchess County in New York State, had grown up on Eaton's Neck, Long Island, a little eastward of Lloyd's Neck. Walter Bates

¹ Captain Saunders' troop and the Bucks County Light Dragoons did not share in the capitulation, because they were on duty during this period at the Quarter House, South Carolina, and the German Hussars are not mentioned as having been present at Yorktown. At the muster of December 24, 1781, Saunders' troop numbered twenty-three and the Bucks County troop, fifty-one. The last figures available for the German Hussars date back a year earlier, when this troop was at New York and numbered sixty-four men.

² Simcoe's Journal, 138, 143, 149, 150, 153, 159, 212, 252, 254, 255; MS. Muster Rolls of Colonel Edward Winslow; Abstracts of the Muster Rolls by Rev. W. O. Raymond (unpublished); Raymond, Winslow Papers, 120, n.; Rev. W. O. Raymond's "Early Days of Woodstock" in *The Dispatch of Woodstock*, N.B., Jan. 23, 1907.

of Stamford, who began to teach a school there in the autumn of 1781, says that this community was composed of Loyalists, most of whom were "churchmen from Connecticut." Refugee clergymen occasionally visited this settlement to hold divine service on Sundays. Some of the refugees rented the property of John Sloss Hobart, a revolutionist, and, locating on it, undertook to support their families by honest industry, but complained early in January, 1782, to Lieutenant-General James Robertson at New York, that they found themselves prevented from enjoying the fruits of their labors by the depredations of the crews of the armed vessels stationed in Huntington Bay for their protection.¹

In April, 1783, the Reverend John Sayre, who seems to have lived at Flushing, Long Island, since his flight from Fairfield in 1779, came to Eaton's Neck to conduct public worship, and at the same time inform the refugee community that the King would grant lands in Nova Scotia to all Loyalists who wished to settle there, besides providing by similar grants for the support of churches and schools in localities thus peopled, and would supply the ships necessary for the transportation of emigrating Loyalists. Mr. Bates at once procured a copy of the royal proposals from Huntington, and at a general meeting of the local refugees it was agreed by all present to take advantage of the terms offered by removing and settling together in the wilderness of Nova Scotia. Accordingly, arrangements were made as speedily as possible, and the little colony on Eaton's Neck embarked on the transport *Union*, Consett Wilson, master, at Huntington Bay, April 11th to 16th, and, sailing by way of the East River to New York, joined nineteen other transports, which were also filled with American exiles. On April 26, this fleet proceeded on its voyage for the River St. John in what is now the Province of New Brunswick. A fortnight later the *Union*, leading the fleet, arrived at Partridge Island, and the next day was moored in the harbour of the St. John, but the company remained comfortably aboard until the lower reaches of the river should be explored for a suitable location. This task was entrusted to David Pickett, Israel Hait, Silas Raymond, and several others, who, after a journey of sixty miles up the St. John and a visit to Belleisle Bay, recommended the site of the present town of Kingston, of which they were to become the founders. The company now disembarked from the good ship *Union*, bade farewell to Captain Wilson who had treated them with great consideration, transferred themselves and their baggage on board a small sloop, and after a day's sail arrived at Belleisle Bay before sunset. The list or "manifest" of the *Union's* passengers, which is still extant, shows that of the 210 persons specified

¹ Bates, Kingston and the Loyalists of 1783, 8-10.

therein, 118 were from Connecticut, twenty-nine from Rhode Island, twenty from Massachusetts, twenty-two from Dutchess County, New York, eight from New Jersey, three from Long Island, and one from Pennsylvania. Of those from Connecticut, Stamford furnished thirty-eight, Norwalk thirty-four, Reading fourteen, Stratford nine, New Haven seven, Fairfield four, Milford and Danbury two each, while New Milford, Killingsworth, and Newtown are credited with one each. Five are indefinitely assigned to "Connecticut." The occupations of the men of the party, which also appear in the manifest were well adapted for the pioneer work they had undertaken; more than half of them were farmers, and there was also a goodly sprinkling of carpenters and shoemakers. In addition there were two blacksmiths, a refiner of iron, a wheelwright, a cooper, a joiner, a mason, a weaver, a seaman, and an attorney-at-law.¹

Mr. Bates tells us that when the women and children set eyes on the unbroken wilderness at Belleisle Bay they "did not refrain from tears." Most of the company spent the night on the sloop which, after landing had been effected the next morning, took its departure. Then came the labor of setting up a sufficient number of tents to furnish shelter for all. This was accomplished the first day. On the second the settlers were alarmed by the approach of ten canoes filled with Indians of the Mimac tribe, but the visit proved to be a friendly one, the spokesman of the Mimacs greeting the whites with the generous and readily understood remark, "We all one brother." Convincing force was given this crisp introduction by liberal presents of moose meat, which the little colony in the wilderness received with gratitude. In July Frederick Hauser was commissioned to survey the new settlement, according to the desires of its inhabitants. As a base for his operations a site was designated for a church and school-house, from which a series of twenty-two lots were laid out on either side of a road that was made six rods wide. It was agreed that the land for the school-house and church should comprise four acres, one each from the adjacent corners of the first four lots; that lot No. 1 on the west side of the road should be reserved for a parsonage, and that the water privileges should be accorded to those who would engage to erect a grist mill and supply the sawn lumber for the two structures to be erected at the head of the road. After these provisions had been specified the lots were drawn, and the men at once set to work clearing spaces for building and laying up their log houses. By November, seventeen of these rude structures had been erected and covered with

¹ Bates, Kingston and the Loyalists of 1783, 10-13; Lawrence, Foot-Prints, or Incidents in the Early Hist. of N. B., 4; Jack, Centennial Prize Essay on the Hist. of the City and County of St. John, 63.

bark, and the new community, thus housed, was able to pass the winter in contentment and even in some degree of comfort.¹

On the day after Easter in the following spring the settlement elected its first church wardens and vestrymen, and was permitted for a time to enjoy the ministrations of the Reverend John Beardsley, formerly of Stratford, Connecticut, who had arrived in the previous autumn with Colonel Beverley Robinson's Loyal American Regiment, of which he had been chaplain. But in 1786 Mr. Beardsley was transferred to Maugerville on the death of the Reverend John Sayre, and remained there until his retirement from the ministry, when he returned to Kingston to spend the remainder of his days. Religious worship continued to be held in the home of one of the parishioners, but without a regular clergyman, until July, 1787, when the Reverend James Scovil came from Connecticut, and was granted the parsonage lot, while the four acres for the church and school were at length transferred to the parish for its use. It was not, however, until the summer of 1789 that an edifice which was named Trinity Church, was erected in Kingston, the money for this purpose being provided partly by local subscription and partly by a liberal donation from the government. In 1803 the Reverend Elias Scovil was employed to serve as assistant rector under his father, who had already become somewhat infirm, although the latter remained in charge of Kingston Parish until his death in December, 1808. Already Trinity Church had acquired a steeple, though it had to wait for two years longer before it could boast the possession of a stove. Its bell came as a gift from some gentlemen in St. John in 1813. However, the prolonged absence of these adjuncts and conveniences did not interfere with the growth of the congregation, for 257 persons were confirmed at Trinity by Bishop Charles Inglis, when he visited Kingston at the close of July, 1809.²

A month before the founders of Kingston sailed from Huntington Bay the commanding officers of fourteen of the principal Loyalist regiments, including the Queen's Rangers, the Prince of Wales American Volunteers, and the King's American Regiment, presented a memorial to Sir Guy Carleton at New York (March 14, 1783), urging that grants of land in some of the royal American provinces be given to the officers and men of their commands, together with assistance to enable them to settle thereon, inasmuch as those who had served the British cause in arms would not be tolerated in the States. It was also recommended that the officers be granted half-pay. This memorial received Carleton's ready endorsement, and its recommenda-

¹ Bates, *Kingston and the Loyalists of 1783*, 11, 13.

² *Ibid.*, 13-17.

tions were soon carried into effect. In August royal instructions arrived at New York looking to the disbanding of the provincial corps, in which it was provided that all non-commissioned officers and privates who desired to settle in Nova Scotia (of which New Brunswick then formed a part) should receive lands in the proportion of 200 acres for each non-commissioned officer and 100 acres for each private soldier, exclusive of smaller grants for the members of their families. The commissioned officers were promised grants according to their rank and half-pay on the disbandment of their regiments.¹

Meanwhile, in the previous April, Lieutenant-Colonel Edward Winslow, Isaac Allen, Stephen De Lancey, and Major Thomas Barclay had been sent to Nova Scotia to explore and locate lands for their comrades in arms. The determination of the place of settlement appears to have rested chiefly with Colonel Winslow, and extended up the River St. John from St. Ann's Point (Fredericton) as far probably as the mouth of the Tobique. Before the end of July the exploring party had returned from its mission, and Winslow wrote to a friend that all were "delighted beyond expression" with the region they had visited.²

On September 12, Sir Guy Carleton issued an order at New York to Lieutenant-Colonel Richard Hewlett of De Lancey's 3rd Battalion to assume command of a number of provincial corps, including those in which the Connecticut Tories had chiefly enlisted, accompany them to the River St. John, and take the necessary measures to get them promptly to the locations allotted for their settlement. During the preceding summer most of the Loyalist regiments had been encamped on Long Island, not far from Brooklyn. Their numbers were now considerably reduced, not only on account of the casualties of the service through which they had passed, but also on account of the fact, previously noted, that many took their discharge at this time in order to return to their old neighborhoods, despite the risk of finding themselves unwelcome, or to seek an asylum elsewhere. As Connecticut, unlike most of the other states, stood ready to pardon those of its exiled inhabitants who were prepared to resume the duties of citizenship under the new conditions, it is likely that some of them now sought her shores. Consequently, when the regiments sailed for the River St. John, September 15, they numbered only about one-fourth of their former strength. From the figures reported to the British commissary's office in New York it appears that up to

¹ Trans. Roy. Soc. of Canada, Ser. III, Vol. IX (1915) 101; Rev. W. O. Raymond's article on "Early Days of Woodstock" in *The Dispatch of Woodstock*, N.B., Nov. 21, 1906.

² *Ibid.*, Nov. 21, 28, 1906.

October 12, 1783, 3,396 persons connected with the Loyalist regiments had embarked for the St. John, namely, 1,826 men, 563 women, 696 children, and 311 servants. A few others left New York later in the season.¹

The fleet of transports on which Colonel Hewlett embarked with the fourteen regiments under his command, besides detachments of two others, did not reach the St. John until September 27, the *Esther* arriving several days later through her failure to keep to her course. The *Martha*, another vessel of the fleet, was wrecked on a ledge of rocks, afterwards known as "Soldiers' Ledge," off the Seal Islands, and only seventy-five of her 174 passengers were saved. These included a corps of the Maryland Loyalists and part of Colonel Hewlett's battalion. At the end of September the troops disembarked and encamped above the Falls. By the 13th of the following month they were disbanded, and began to proceed up the river as speedily as the lack of small craft would admit. Among these were many men of the King's American Regiment who, together with their associates of other corps, passed a distressing winter at St. Anns. Some, however, were fortunate enough to find shelter in the hospitable homes of pioneer settlers along the river. But the majority remained at Parr Town (St. John) until the following spring, and not a few drew lots here, including some of the Queen's Rangers. The Prince of Wales regiment was not disbanded until October 10, 1783, and wisely chose to spend the ensuing months at the mouth of the river on account of the lateness of the season and the great distance of their tract. Captain Stephen Hoit and other officers of this corps built houses in Carleton (now West St. John), and were evidently still there when they presented a memorial to Governor Carleton in December, 1784. However, the dissatisfaction prevalent among these officers had been freely expressed in private correspondence previously, one of their number, Lieutenant-Colonel Gabriel De Veber, writing from Parr Town a year earlier than the date of the memorial that he was altogether discouraged because of the remoteness of the land drawn by his regiment, and would think himself highly culpable if he did not try to settle nearer the metropolis, or some other place, where he might educate his numerous family. That conditions at Parr Town, the "metropolis" to which Colonel De Veber referred, were bad enough is evident from the testimony of the Reverend John Sayre who, arriving in 1783, was distressed at the multitudes utterly unsettled, many of them

¹ Rev. W. O. Raymond's article on "Early Days of Woodstock" in *The Dispatch of Woodstock*, N.B., Dec. 5, 1906.

unsheltered and on the brink of despair, by reason of the provincial government's delay in assigning them lots.¹

This delay was due to the heavy demands on the time and strength of the surveyors, who were already swamped with the labor of laying out lands for the great number of refugees who had arrived earlier in the season. Twelve-mile tracts or blocks had, however, already been marked out for the regiments on the River St. John, the locations of the various corps being determined by lot. As five of the regiments, including the Prince of Wales American Volunteers, deemed their blocks too distant for occupation, they eventually obtained more convenient situations in the counties of York, Sunbury, and Queens. Block No. 4, or Canterbury Township, on the west side of the river fell to the King's American Regiment, which early in 1784 formed the first settlement in old Lower Woodstock. This settlement was founded by Captain Isaac Atwood and a small number of associates at "Bel-viso," forty miles above St. Anns on the land allotted to them. In August, 1785, this little community numbered thirty-one men, thirteen women, and twenty-three children, all but ten being connected with the regiment named. Two hundred and thirty-six others of this corps, including women and children, were also settled on the regimental land at this time. As the King's American Regiment had a total enrollment of 345 on its arrival at Parr Town, fifty-two of its members had seen fit to seek domiciles for themselves elsewhere. Block No. 5, or Queensbury Township, on the east side of the River St. John had been drawn by the Queen Rangers, of whom 361 individuals out of a total of 397 were actually occupying their lands in the fall of 1785. The dissatisfaction in the Prince of Wales regiment with the block first drawn by its officers and the consequent delay in finding a new location serve to explain the greater decline in the number of those settling on the lands finally designated for their occupation than in the case of other regiments. The enumeration of 1785 shows that only 261 persons out of the 355 connected with the corps on its arrival in New Brunswick were in residence on their lands at the time indicated. What became of the other ninety-four it would be difficult to trace, although in a census of July 29, 1785, of those settled in the district between the Nashwaak and the Madam Keysquick we find eighteen of this corps accounted for, and five others appear among the inhabitants of Shelburne, Nova Scotia, at the same period. Shelburne also contained thirty-seven representatives of the King's American Regiment, namely, fifteen men, nine women, and thirteen

¹ Rev. W. O. Raymond's article on "Early Days of Woodstock" in *The Dispatch of Woodstock, N.B.*, Dec. 5, 19, 26, 1906.

children. Parr Town and Carleton had gained noteworthy groups of Connecticut Loyalists as permanent residents in 1783, and smaller groups had established themselves in the same year at Maugerville and Burton. Other refugees from Connecticut soon scattered both within and without the Province of New Brunswick, single families or individuals going to St. Andrews, St. Stephen, St. George, L'Tete, Hampton, Petersville, Fredericton, Indian Island, and into Westmoreland county, New Brunswick, while beyond the borders of the province they were to be found in such widely separated localities as Annapolis, Nova Scotia, the Bay of Quinte, New Johnstown on the St. Lawrence, and the Bay of Chaleurs.¹

If, as has been estimated, Connecticut had about 2,000 male Loyalists at the beginning of the Revolution,² we are surely safe in saying that she lost well on to a half of these through flight, and that the great majority of the survivors among these refugees found permanent homes for themselves and their families along the St. John River in New Brunswick.

¹ Raymond, Winslow Papers, 241-243; MS. Record of Col. Edward Winslow in the possession of Rev. W. O. Raymond, St. John, N.B.; Raymond, Winslow Papers, 222, 215, 244; Sabine, *Am. Loyalists*; N. Y. Geneal. and Biog. Record for the years 1904 to 1909, inclus.; Colls. N. B. Hist. Soc., No. 9 (1914), pp. 504, 505, 509

² *Am. Hist. Rev.*, Jan., 1899, 278.

An Historical War Crop—The Canadian Wheat Crop of 1915

By C. C. JAMES, C.M.G., LL.D.

NOTE.—The reader who desires to study more fully the question of the world's production of wheat in the year 1915, is referred to a very comprehensive article in *The Agricultural War Book, 1916*, (Dept. of Agriculture, Ottawa) pp. 153-176 incl., "Wheat and the War," by Mr. T. K. Doherty, Canadian Commissioner of the Imperial Institute of Agriculture.

(Read May Meeting, 1916)

This Great War is different from every other war; it is a contest not simply of men but of national resources. It involves the soldier in the trenches, the sailor on the high seas, the airman above the clouds, the miner underground, the artisan in the factory, and the farmer turning the furrow or reaping the harvest. Women at the lathe and children in the gardens are in the reckoning. The chemist working early and late in his laboratory, and the grandmother untiringly knitting socks are sharing in the contest. It is, as never before, a struggle of the nations and all that these nations control.

When the history comes to be written of "Canada and the Great War," account must be taken of farm production in 1915, which in this regard may well be called "The Year of Plenty." Waging war involves more than men; munitions, equipment, food, and transportation must all be reckoned. Without these latter men are of no avail; unsupported they are useless. The story that tells only of the weary trenches and the gallant attacks, heroic and thrilling though they may be, will be incomplete. The ample supply of cartridge and shell, and the daily ration of bread and jam, of beef and bacon, are absolute essentials. No more interesting chapter will be told than that of Britain's munitions; and equally so will be that which recounts how several million men were fed, in fact, were well fed. In the history of the wars of other times, little or no attention has been paid to the question as to how the armies have been supplied with food, except in the case of besieged cities where hunger played a most important part. But this war is not like other wars. In every country involved the question of food supplies has played as important a part as the supplies of munitions.

Immediately on the outbreak of the War a Food Commission was formed in Germany composed of sixteen experts under the Chairmanship of Doctor Paul Eltzbacher, Rector of the Commercial College

of Berlin. This Commission made an exhaustive study of the question.¹ Here is the concluding paragraph of the first chapter:

"How can Germany manage without the food at present imported from abroad and without the imported materials which are used in the production of food? The problem is not only of theoretical interest, but of the very greatest practical importance, for it concerns nothing less than the outcome of the war. The efficiency of our army, our transport service, and our finances has been brilliantly proved. If we wish to win, the organization of food supplies must not be lacking."

Britain also has her food problems, involving not only herself, but her Allies, France, Belgium, and Italy, and to some extent also Switzerland. She has had not only to find the food but also to see it safely delivered. Food from overseas has been even more important than munitions from overseas. In this regard Canada has played a most important part—in fact, the first call that came to Canada was not for men, as these had been offered in advance, but for food, and for wheat in particular. It will therefore be fitting that some brief statement be placed on record, and be made readily available, of the great wheat crop of 1915, as it properly forms an interesting, and to some extent, an important factor in the story of the second year of the War. Even if the War should extend so long that this crop should have to be passed over lightly in the record of the great War, the importance of it to Canada will still remain and it will appear again in other records, for it will some day be realized that it played a most important part in saving Canada west of the Lakes from a most serious financial situation. Furthermore, it was, as to both quality and quantity, the greatest wheat crop that any country has ever gathered from twelve million acres of land. Historical students find interest in recalling "The Hungry Year" of Upper Canada in 1788,² when the crops failed, and the settlers shared with one another the scanty supply of potatoes and passed to their neighbours the beef bones with the hope of extracting the last trace of nourishment. At some future time historical students will be able to estimate more fully the national value of the great crops of 1915; but it may not be untimely or uninteresting to gather together now a few facts that will help the student in his survey of Canada during the period of the war.

¹ "Germany's Food, Can it Last? The German case as presented by German experts." University of London Press, 1915, p. 232. See also criticism of this Report by Prof. W. J. Ashley in *The Quarterly Review*, October, 1915; also article dealing with these two and other reports, "Statistics of the Food Supply in Germany," by Dr. Robert Morse Woodbury, of Cornell University in Quarterly Publication of the American Statistical Association, Boston, March, 1916.

² See *The Settlement of Upper Canada*, by Dr. Wm. Canniff, pp. 196, *et seq.*

Just one hundred years ago began the British immigration to Upper Canada. The soldiers home from the Napoleonic Wars were being disbanded, and many of them, seeking new homes, crossed the Atlantic and took up lands set apart for them in Upper Canada. The U. E. Loyalists had taken up lands and formed four more or less compact settlements—along the St. Lawrence from Gananoque to Cornwall, from Kingston westward around the Bay of Quinte, in the Niagara Peninsula, and in the two adjacent townships on Lake Erie. The settlers from overseas began to fill up the vacant sections on the frontier. Some settlements were also begun in the rear townships such as that on the military grants at Perth near the Rideau Canal, to which there came in 1816 some settlers from Ireland. For these settlers wheat was the important crop, as not only was it their own most important food, but it was their most valuable export product. For forty years and more wheat was “King” in Upper Canada. The greater immigration from the British Isles was begun in the forties, and, soon after, the extensive introduction of live stock added to the field products beef, mutton, butter, and cheese. The virgin soil of Upper Canada produced some large crops of wheat in those early days; 30, 40, and even 50 bushels to the acre were quite common. Ontario farmers in 1915 had hopes at one time of equalling, if not surpassing, the crops of which they had heard their fathers and grandfathers talk. And so they did in some cases, and would have done so quite generally if only the summer rains had ceased as harvest time drew near. As it was the average was the highest in six years and the total yield was over 12,000,000 bushels in excess of 1914.

The western wheat crop of 1915 began in Ontario over seventy years ago. About 1842 a Scottish farmer named David Fife, in the township of Otonabee, Peterboro County, grew some wheat from a sample sent him by a friend in Glasgow, which soon spread through the neighbourhood, became a standard variety in Ontario, and then began a journey westward. In about fifteen or sixteen years it reached Wisconsin and Minnesota, and a few years later found a congenial home in the valley of the Red River in Manitoba. The soil in the Red River Valley was by nature most favourable for the production of cereals, and in it there developed what grain and milling experts have recognized as the ideal type of world-wide wheat, giving it a name that has remained ever since as the highest world standard, namely, “Manitoba Hard.” It may be noted here that this same soil is still capable, after forty years’ cultivation, of producing “Manitoba Hard.” Its richness has not been exhausted, but its accumulation of humus has been lessened, and, as a consequence, its moisture-holding power has been somewhat reduced, so that crop production is now more controlled

by weather conditions than was the case in the early days. Ontario, or Upper Canada, had been famed in the early half of the century, for its great wheat producing powers. Fall wheat was and still is grown in Western Ontario and spring wheat in Eastern Ontario. In the seventies the millers reported that Ontario spring wheat had quite suddenly lost its milling quality. Either new seed had to be obtained or spring wheat growing had to cease. Mr. R. C. Steele, of Steele Bros., Toronto, in 1876, went to Manitoba by way of St. Paul, Minnesota, and succeeded in securing 857 bushels of Red River Valley Fife Wheat of "hard" quality, which he brought down by rail and water. This was the first exportation of Western Canada wheat to the East.

The wheat crops of Manitoba grew in acreage, and drew settlers from the East and the South. Wherever a settler built his shack and turned the rich, black soil to the sun and air a crop of heavy, hardy wheat matured; such as for years had been grown about the scattered Hudson Bay Posts. From remote Fort Chippewayan came the wheat to the Centennial Exhibition at Philadelphia; that surprised thousands of eastern people. The Golden West had been discovered and the people of Canada began to realize the dream of the first transcontinental railway, which was finally completed in 1886. Meanwhile, during the construction of the Canadian Pacific Railway, wheat growing had been rapidly extending west, and the Portage Plains and Brandon became familiar names in Eastern Canada. Following the shipment of seed grain in 1876, referred to above, there gradually developed a trade from the West to the Ontario millers by way of Port Arthur and the Great Lakes. It was in 1884¹ that Mr. Thomas Thompson, of Brandon (now of Winnipeg), made what is generally considered as the first through shipment by all-Canadian route of a carload of wheat across the Atlantic to Glasgow. Mr. Thompson's own statement will be found in the Appendix.

The completion of the Canadian Pacific Railway opened the door to the Great West. The world was calling for bread, prices were favourable and a steady stream of easterners poured into the open areas of the prairies, and by 1910, had nearly nine million acres in wheat. We may now introduce a statistical table of wheat production in Canada in the past six years.

¹ Mr. George Johnson in his "Alphabet of First Things in Canada" states that the first exportation of wheat from Manitoba to Europe took place in October, 1877, and that the first train of wheat, 16 cars, left Portage la Prairie for Montreal in December, 1885; see appendix.

	Area Acres	Yield Bushels	Per Acre Bushels	Average price to farmer	Value per acre
1910	8,863,000	132,049,000	14.89	\$.75	\$11.17
1911	11,101,000	230,924,000	20.80	.64	13.31
1912	10,997,000	224,159,000	20.38	.62	12.64
1913	11,015,000	231,717,000	21.04	.67	14.10
1914	10,294,000	161,280,000	15.67	1.22	19.12
1915	12,986,000	376,304,000	28.98	.83	24.05

Down to 1910 wheat growing in the West had been for many a most profitable business; thousands of wheat growers had made money. The prosperity of the West had resulted in the rapid building up of scores of towns that became centres of commercial activity. The land boom of the West resulted, not only in a steady advance in farm-land values, but also in the over-expansion of cities and towns, and the money spent on municipal improvements was limited only by the possibilities of borrowing. From the table it will be seen that the day of dollar wheat had disappeared for a time, due to the great increase in world production. Investigation has shown that, taking all charges into the reckoning and allowing the wheat grower standard wages, it costs on the average about \$12.00 to produce an acre of wheat.¹ What, on this basis, does our table show us? That for the four years 1910 to 1913 wheat growing in Western Canada was not, from the national standpoint, a profitable industry. We have here the main explanation why the abnormal and artificial expansion of land values, especially in towns and city holdings, must collapse and why "hard times" began to be manifest in 1912 and 1913. The wheat grower works for only a part of the year. For four years tens of thousands of Canadian citizens were working only half time; they were producing immense quantities of food and selling the same at little, if any, above the cost of production. Most of this food was being shipped out of the country. In other words an immense amount of Canadian labour was being used to produce cheap food for Great Britain; and at the same time the wheat growers were consumers of food produced elsewhere in Canada. The writer believes that in this is to be found one of the most important factors in the great rise in the cost of living in Canada during these four years, and why in Canada the cost of living increased more rapidly than in many other countries.

¹ See Report on Cost of Living, Ottawa, 1915, Vol. I, pp. 34, 760-772.

Such was the condition when the war broke out. Over ten million acres were in wheat in 1914, and the weather had not been favourable for the growing crop. A crop lower by five bushels per acre than any of the previous four years was about ready to harvest, and its quality also was inferior. The war at once drove prices up. Replace the average price of \$1.22 per bushel by those of the previous four years and consider what would have been the condition of the western wheat growers! What would have happened to business in western towns and cities if the market conditions of 1910-13 had continued in 1914? An average return of only \$10.50 an acre would have left a deficiency that the beef, pork, mutton, butter, and wool could not have offset. The readers of this article will, from the above, appreciate why the extension of mixed farming was assuming such great importance in the economic development of the three prairie provinces.¹

Just before the war broke out reports began to come forward that through lack of moisture a large area of land in southwest Saskatchewan and southern Alberta was threatened with crop failure, and the Dominion Government was appealed to for special help. The Minister of Agriculture was making a personal inspection of the situation when the outbreak of the war recalled him to Ottawa. It was found that farmers who had adopted the best practice of cultivation had fair crop growth on land previously summer fallowed; in all other cases there was complete failure. The settlers in these districts were tided over by the Government, and they were advised to summer cultivate their land as thoroughly as possible.² A number of demonstration farms were organized in these districts under the Dominion Experimental Farms Branch to show the value of what is ordinarily known as "dry farming," which is merely a name for the thorough and scientific cultivation of soils in such manner as to conserve moisture. It may

¹ It may be worth while to note that the above statement of cost of production makes no reference to the national cost, that is, it does not make any allowance for national expenditure incurred in making the wheat lands available and placing the wheat grower on the land; nor does it take into consideration the matter of soil depletion. A bushel of wheat contains soil fertility having commercial value of 25 cents, at prices prevailing before the war. The nitrates, phosphates, and potash which the wheat removes from the soil are marketable materials. The European wheat grower buys these substances as commercial fertilizers and applies them to his soil in order that he may produce a crop of wheat.

² In the spring of 1915, no less than 48,630 applications for seed grain were received by the Dominion Government, involving over 3,000,000 bushels each of wheat and oats. The outlay for seed grain and relief assistance amounted to about \$13,362,958, which was advanced in the form of loans, the loans being liens on land and crop.

be mentioned here that large areas that in 1914 produced nothing, in 1915 carried crops that in some cases yielded as high as 45 bushels to the acre, due partly to good soil cultivation and partly to favourable weather conditions.

The crop of 1914, as we have seen, was light and, therefore, called for less labour than usual: the fall was clear and protracted, giving opportunity to the farmers to increase their fall ploughing. Entering into the patriotic spirit of the Empire's call for food and stimulated by the high prices prevailing in the last three months of the year the western farmers in 1914 prepared for a record crop in 1915. During the winter months of 1914-15 suggestions from enthusiastic easterners were many and various. Most of them were quite impracticable. More than one ardent patriot advised the mobilizing of forces—men, horses and machinery, the ploughing up of a few million acres of virgin prairie soil and the sowing of several million bushels of wheat. This suggestion was advanced through lack of understanding that wheat is not grown just in that way; that as far as wheat is concerned nature does not respond so readily. Further, in war time especially, no country can afford to spend two dollars to produce one dollar's worth of food. It was decided that the sure and safe way was to stimulate the regular growers of wheat to intensify their efforts, to warn them against spreading their energies over too large an area, and to follow more carefully than ever the well established practice—thorough cultivation of the soil and the sowing of only the best varieties of seed well cleaned. Added to this, the weather which in 1914 was unfavourable for crop production, was favourable for soil preparation for the following year. What was the result? The Empire needed bread, an abundance of bread; and Canada, especially western Canada, needed a big crop. Providence favoured the western prairie grain grower beyond his fondest hopes. A crop resulted more than double that of the previous year and nearly 150,000,000 bushels in excess of any former year. It was a crop that no one, apparently, could forecast. Those who were most optimistic hesitated to make public their estimates. Supplies of gasoline gave out in some sections; and in others even complaints were heard as to the large amount of binder twine required! It was only when the full rich streams of golden grain began overflowing from the separators that it dawned upon the farmers themselves that a record crop had been harvested.

The following estimates of the three prairie provinces, published by the Dominion Census and Statistics Office, are interesting in this regard:

Preliminary estimate, Aug. 31, 1915.....	275,772,200 bushels.
Provisional estimate, Sept. 30, 1915.....	304,200,000 bushels.
Final estimate, Jan. 13, 1916.....	342,948,000 bushels.

The above, it should be remembered, are based on the growers' own reports. With regard to the final estimate it might be stated that it is conservative and might have been made somewhat larger without the statistical experts being fairly charged with over-statement. It was only when the threshers' returns had been received that there was no longer doubt as to the results. From a list of eighty-seven wheat growers scattered over the three provinces, I have made the following record: 11,786 acres in all produced 526,731 bushels, an average of 44.7 bushels to the acre. The lowest yield was $26\frac{1}{3}$ bushels (on stubble), the highest was $83\frac{1}{3}$ bushels (on 3 acres). There were in the list several as high as 70. One of 85 bushels is not included, as the acreage was not stated. In a paper of this nature, claiming to have some historical value, it would not be permissible to include or introduce "fairy tales," but when one has authentic records it is allowable to narrate them, as they are more or less typical of the higher class of production:—

The crop that paid the mortgage. A farmer in Manitoba, a two-year settler from the United States, began the year 1915 with a mortgage of \$1,200 on his farm. When he started south at the end of the year to tell the good news to his former neighbours he had paid off his mortgage and had 10,000 bushels stored, held for a higher price.

The crop that could not be haled out. In June a hailstorm struck the farm of a man in Saskatchewan. The damage was appraised and the Insurance Company settled for the loss. The surviving wheat renewed its life and gave a crop of 30 bushels to the acre. He did not repay the insurance as he stated that he would have had 50 bushels to the acre but for the hail.

The crop that sowed itself. A farmer in the dry area in 1914 left his 50-acre crop uncut—it was considered not worth cutting. His sons started in to plough it up in 1915, and, after ploughing under 30 acres concluded to leave the other 20, and turned their attention to other land. They saw that the 20 acres had produced some grain that looked promising. The new sowing gave 50 bushels to the acre, but the 20 acres that sowed itself threshed out 30 bushels to the acre.

The crop that fooled the hired man. A farmer in Alberta had part of his seed in the ground when the hired man suddenly left to enlist. A new man was engaged, and in the rush of work, instructions were somewhat hurried and indefinite. Unfortunately, the new man sowed a small portion of the land a second time. This double-sowed portion yielded 83 bushels to the acre.

The crop that sold itself. In the dry area there was a disconsolate farmer. He had exhausted his resources and his credit, having had no crop in 1914. Late in the spring of 1915 he heard of the government help available. He procured enough seed to put in his crop and then waited for results and the sheriff. In due time the sheriff came, seized the crop, had it threshed, sent it to the elevator, paid the judgment, and handed the farmer a cheque for the balance, \$3,000.

I have stated that the computed yield of 28·98 bushels to the acre is not an over-estimate. Yields of 45, 50, 60, and even more bushels to the acre were so commonly reported that one is apt to conclude that the West must have produced a crop well in advance of 30 bushels. However, it must be remembered that high yields are apt to be well advertised and low yields are ignored.

The next point, and it is one of very great importance, is that the quality was high. The crop of 1915 graded away above the crop of 1914. The best proof of this is in the statement of inspection at Winnipeg, kindly furnished by the Dominion Grain Commissioners for the purpose of this article. The full statement showing shipments up to January 31st, 1916, will be found appended to this paper. From this, which shows the elaborate and thorough inspection carried on by the Grain Commission, we make the following deductions:

No. 1 Hard and No. 1 Northern formed 54 per cent of the 1915 crop, and only 19 per cent of the 1914 crop.

Over 90,000,000 bushels of grades No. 1 Hard and Nos. 1, 2, and 3 Northern of the 1915 crop more than of the crop of 1914 were shipped east up to January 31st.

Winter wheat (Alberta Red), which forms only a very small portion of the western wheat crop, graded low in 1915.

The total grain hauled in 1915-16 was over three times that of 1914-15, clearly showing extraordinary preparation and efficiency on the part of the Canadian railways. One can readily understand why piles of grain were still to be found along some branch lines when winter set in.

Canada had produced a crop at least 100,000,000 bushels in excess of the expectations of the Departments of Agriculture, of the transportation companies, and of the farmers themselves; the United States had produced a crop of 1,011,000,000 bushels, 120,000,000 bushels in excess of the previous year, and 248,000,000 in excess of the crop of 1913; and the world's crop "was" about 4,000,000,000 bushels, or 900,000,000 in excess of 1914. The question at once arose in the minds of many, and publicity was given to it—Has Canada overdone it? Can it be marketed at a profit? The answer has already been given. As fast as farmers could deliver it, and the railroads, with their increased equipment, could handle it, the crop was going forward at a rate never known before; and the market prices, while, naturally, not as high as in the first war year, were from 15 to 20 cents a bushel in advance of the years 1910 to 1913. How can this be explained in view of the fact that ocean rates had increased from 6·3, 6·9, and 7·6 cents per bushel in the three fall months of 1914 to 24·3, 28·9, and

39.5 cents in the fall of 1915?¹ The superior quality of the Canadian wheat is one explanation and the high ocean rates is another. In times of peace the difference in ocean rates from Canada, the United States, Argentina, and Australia to Liverpool is only a small fraction of the value of the wheat; but when war is on shipping is reduced and trade routes must be guarded. As a consequence the movements of wheat are seriously interfered with. The Russian surplus, which can come out only by the Dardanelles, was shut off. When Britain, France, Holland, and other European countries required wheat they were compelled to seek it from the nearest country that had wheat to ship over a safe route. Canadian wheat went forward as rapidly as farmers could load it and trains and ships could carry it, and the extra cost of transportation was passed on to the European purchaser. Canadians, who in their limited view of the situation, were loudly complaining of the high ocean rates and demanding that the Government should do the impossible, did not realize that it was because of these high rates that Canadian wheat was selling as a preference. The British consumer, if any one, had cause to complain, for he has been paying the extra transportation rate in the increased price of bread. Before the war the Londoner paid less per pound for bread than did most Canadians; during the war he is paying more. In August, September, and October, 1914, bread sold in Toronto at $3\frac{1}{3}$ to 4 cents a pound; in the corresponding months of 1915 the prices were the same or a shade lower; bread in London, England, in August, September and October, 1914, sold from $2\frac{3}{4}$ to $3\frac{1}{4}$ cents a pound, and in the corresponding months of 1915 from $3\frac{3}{4}$ to 4 cents a pound.²

Australia at the present time has a large wheat crop but ocean rates are excessive, insurance rates are high, and steam shipping is well-nigh unprocurable. As a consequence the Federal Government has taken possession of the crop and had advanced 75 cents a bushel to the farmers. When and how it will be forwarded to Europe is somewhat uncertain at the present time. Further rise in rates has been restricted by this federal action, but shortage of tonnage is seriously interfering with its transportation to Europe, and Australian

¹ Very complete tables of ocean freight rates for wheat covering a long period of years will be found in *Census and Statistics Monthly*, Ottawa, February, 1916. The same question is discussed in Mr. Doherty's paper referred to before.

² Information as to cost of bread and flour in Canada and in Great Britain will be found in the *Report on Cost of Living*, Ottawa, 1915, Vol. 1, pp. 34, 35, 36, 747 to 759, inclusive. It will surprise Canadians to know that in some of our cities it costs from $1\frac{1}{2}$ to 2 cents to deliver a three-pound loaf. In England cost of distribution is much less. This should be considered in comparing prices of bread. High cost of distribution plays an important part in cost of living in Canada. See note in Appendix on "Flour and Bread."

wheat growers must wait patiently for the disposal of their crop and final settlement.

Further the work of inspection and grading performed by the Board of Grain Commissioners for Canada must be considered. All the wheat that passes through Winnipeg carries the endorsement of Canada, which is recognized by European importers. This gives Canada a decided advantage in competitive selling.

Now we come to the question as to the reasons or causes of the great wheat crop of 1915. Again and again it has been called a "freak crop." This is not a fair designation of the crop, as it suggests no special credit to the producers and implies that there is no clear explanation of its origin. The reply to that, as far as the farmers are concerned, is that they increased their acreage by about twenty per cent and worked early and late in cultivation, seeding, harvesting, threshing, and marketing. It is only fair that due credit be given to the farmers for their energetic response to the Empire's call for food.

Owing to unfavourable weather the crops of 1914 were light and, therefore, there was less soil depletion than usual; in other words, there was what might be called a "surplus" amount of available plant food in the soil for 1915. The light crop of 1914 left the farmers free to summer fallow and to do a larger amount of fall ploughing than had ever been done before. The spring of 1915 also was favourable for cultivation. As to the weather, there is more mystery. All through the growing season the crops were watched with some anxiety. Frost at one time was threatened and during the final ripening season in Manitoba snow did some damage. There were, however, two most favourable periods. When the bloom was on and fertilization was taking place the weather conditions were most favourable over the entire country and pollination was complete. Never before had there been such a complete fertilization of the entire head with the result that the spikes were complete from top to bottom with perfect grains. As may be readily realized the yield is dependent mainly upon the number and size of grains formed in the head. The heads in 1915 were long and perfect and the straw was stout enough to hold up the heavy load that it carried. The other favourable period was that following the bloom when rain and sunshine were well balanced. Then it was that the farmer watched with joyous heart the miraculous growth of his fields, and at the same time turned an anxious eye to the sky, noting clouds and wind, and studying weather forecasts.

The third factor, that of improved varieties, must not be overlooked. Red Fife, which had originated in Ontario some seventy years before and established the grade of Manitoba Hard was still much

in use, and Marquis, its offspring, the gift of science to the Canadian people, was running it a close second for popularity. In 1915 all varieties did well, but the big yields recorded so commonly in all three provinces were credited in most cases either to Fife or Marquis. These two varieties undoubtedly contributed many millions of bushels to the large total.

In ordinary years the variations will lie between ten bushels and forty-five bushels per acre. In 1915 the variations were between 15 bushels and 70 bushels per acre. In the year of big yields the great importance of thorough cultivation and of good seed were patent everywhere.

The Empire and the Allies will need more bread in the coming year than in the past, because their armies are larger, more and more men have been called to the front, drawn largely from the producing classes. If the war continues with its present intensity and destructiveness, Canada will be called upon not only for the reserve supplies of 1915 still to be marketed, but also for whatever she can produce in 1916. Whether the wheat crop of 1915 can be repeated is uncertain, in fact, doubtful; but no one can forecast with certainty. First of all there is the handicap of less summer fallowing and fall ploughing in 1915, and a larger portion of the crop than is desirable will have to be grown on spring cultivated land. Farm labour is not so abundant as in 1915, but men with determination and enthusiastic spirit can surprise even themselves. On the other hand two favouring factors may be mentioned. The winter of 1915-16 has been abundant in precipitation and the year starts with a larger supply of soil moisture than usual. Then there is available to everyone seed grain of first class quality, which, if well cleaned, should give the plants a better start than the crop of 1915. Some of the wheat area will be replaced by oats, barley, and flax, and any deficiency of wheat may be made up in beef, pork, mutton, butter, and wool. If so, Canada on the whole will not suffer.

Ontario and the Genesee Valley were once fine wheat-growing countries. But there wheat has given place to live stock, dairying, gardening, and fruit. Iowa and Illinois were, some years ago, famous for wheat, but now wheat takes but a secondary place. As population has increased and farm lands have risen in value, the wheat crop has moved west to cheaper land. It is the pioneer's crop. It is the crop that the settler with limited capital on cheap lands must grow perforce. Under usual conditions it is the only crop that the settler can profitably grow.¹ Before the war, during the years 1910-13, the

¹ This question is fully discussed in an article "The Movement of Wheat-Growing," by C. W. Thompson, printed in *The Quarterly Journal of Economics*, Novem-

price of wheat in Canada had shown a steady decline because there were so many settlers with limited capital the world over who were opening up new lands and who, by necessity, were restricted to wheat. No country, however, can expect to make permanent progress if it depends upon wheat as its main product. The Great West cannot become a country of general prosperity until mixed farming has become well established. This is fully recognized not only by governments, but, to a large extent, by the people themselves, and the movement towards meat and dairy production in the prairie provinces has become increasingly marked of late years. This historic wheat crop of 1915 has contributed and is still contributing towards the strengthening of the Allies at the front; it is helping to relieve a serious financial situation in the West, and it will also be of great assistance in hastening the development of mixed farming on the prairies by the extra cash that it is bringing to the farmers, a condition that is of more importance to all Canada than eastern people are likely to realize.

Though the necessity of extending and encouraging mixed farming in the West for the future stability of that country is not well understood by easterners, yet the desirability of it seems to be quite commonly held, or at least expressed. Advice is more frequent than practicable suggestion as to how this is to be brought about. Apparently the factors involved are not always well understood. The growing of wheat involves a moderate capital outlay and may bring cash returns within six months, and the industry is adapted to a country of wide variations both of land and climate. The successful keeping of live stock requires capital, a much larger investment in animals and buildings; it calls for ability not only to care for animals but also to grow and store food products of varied nature. Capital or credit, also, must be available to await market returns. Farmers who read, observe and think are profiting by this big cash wheat crop to enlarge their mixed farming operations.

Recognizing the importance of the wheat crop in the settlement of the vast areas of Western Canada and the desirability of safeguarding the marketing of it, the Government of Canada has provided for its inspection by the Dominion Grain Commission. No other country in the world has such a complete plan of inspection, and, while market price manipulation apparently cannot be controlled, the western grower of wheat knows that the crop that he produces and delivers to the local elevator or loads into the railroad car will find its place in the Europ-

ber, 1903, and reprinted in "Selected Readings in Rural Economics," compiled by Prof. Thomas Nixon Carver of Harvard University, Ginn & Company, Boston, 1916. This deals mainly with Minnesota, but also sets forth the movement from the Eastern States to the Western.

can market in the class or grade determined by the Grain Commission. Further, the merchant of Europe who cables an order knows that it will be filled with grain according to grade, with the endorsement or guarantee of Canada upon it. No other food product of Canada has received quite so much care and supervision from governments, Dominion and Provincial, as wheat, for the reason, I suppose, that it has been the outstanding export crop of Canada. The question of marketing products is being given more attention. Hitherto the increasing of production has, to a large extent, absorbed the thought of agricultural investigators and the instruction of producers has been considered of most importance. Gradually, however, it has come to the attention of students of agricultural problems that marketing—transportation and distribution—demands immediate attention. Not only to producers but also to consumers it must be apparent that in Canada there has developed as an outcome of our mode of life an unnecessarily wide "spread" between cost of food production and price to consumer, owing to our complicated and expensive methods of distribution. Bread is the one great staple of food that has maintained an even price. World conditions arising out of the war are directing national thought to the more serious consideration of the production and marketing of Canadian meats and dairy products.

This story of the great wheat crop of the Canadian West is only a part of the story of the production of 1915. The wheat crop was the response of only a portion of the farmers of Canada. It was a grand production, but, big as it was in value, it represented hardly one-third of the total output of the farms in Canada. When the full story comes to be written, beef and bacon, butter and cheese, and eggs, and a score of other products will have to be considered, alongside of which, so far as money value is concerned, the much-talked-of munitions output will make a comparatively small showing.

APPENDIX

Wheat Production in Canada

	Area Acres	Yield Bushels	Yield per acre
1880.....	2,336,554	32,350,269	13.84
1890.....	2,723,883	42,223,372	15.50
1900.....	4,224,542	55,572,368	13.15
1901.....	4,031,464	88,593,806	21.97
1902.....	3,955,596	97,031,617	24.53
1903.....	4,416,358	81,730,938	18.50
1904.....	4,428,412	72,238,569	16.31
1905.....	4,963,470	107,566,162	21.66
1906.....	6,095,726	136,257,628	22.35
1907.....	6,095,605	93,232,408	15.29
1908.....	6,630,309	112,887,800	17.02
1909.....	7,770,918	167,209,600	21.52
1910.....	8,863,151	132,049,000	14.89
1911.....	11,100,673	230,924,000	20.80
1912.....	10,996,700	224,159,000	20.38
1913.....	11,015,000	231,717,000	21.04
1914.....	10,293,900	161,280,000	15.67
1915.....	12,986,000	376,304,000	28.98

In the above table the figures for 1880, 1890, 1900, and 1910 are from the census: the figures 1901 to 1907, inclusive, were compiled by Mr. T. K. Doherty, Commissioner for Canada, International Institute of Agriculture; the figures 1908, 1909, and 1911, to 1915, inclusive, were compiled by Mr. Ernest H. Godfrey of the Census and Statistics Office.

Board of Grain Commissioners for Canada

STATEMENT—Showing the total quantities of wheat, by principal grades, received at the Public Terminal Elevators, Fort William and Port Arthur, between September 1st and January 31st of the Crop Years, 1914-15 and 1915-16.

Grades	Sept. 1st, 1914, to Jan. 31st, 1915	Sept. 1st, 1915, to Jan. 31st, 1916
1 Hard.....	16,622·00	2,296,583·30
1 Northern.....	9,799,890·20	86,855,160·00
2 Northern.....	18,835,387·50	27,991,317·20
3 Northern.....	12,511,801·50	17,072,911·40
No. Four.....	6,161,191·20	6,582,208·20
No. Five.....	1,324,503·10	1,799,497·00
No. Six.....	266,568·40	492,968·20
Feed.....	25,387·50	130,881·50
Rejected 1 Nor.....	678,086·10	2,163,663·20
Rejected 2 Nor.....	469,407·20	753,264·20
Rejected 3 Nor.....	276,205·20	724,765·50
Rejected No. Four.....	99,559·10	65,777·40
Rejected Sundries.....	7,988·10	60,099·10
Smutty 1 Northern.....	52,759·00	836,279·40
Smutty 2 Northern.....	321,519·00	533,920·00
Smutty 3 Northern.....	238,015·00	319,596·20
Smutty No. Four.....	72,551·30	113,512·10
Smutty Sundries.....	51,299·00	188,259·30
No Grade Tough 1 Hard.....	.....	4,061·40
No Grade Tough 1 Nor.....	130,669·10	4,854,246·10
No Grade Tough 2 Nor.....	532,397·30	3,407,895·50
No Grade Tough 3 Nor.....	335,677·30	2,660,051·00
No Grade Tough No. Four.....	97,162·40	1,176,605·40
No Grade Tough Sundries.....	274,786·50	1,393,125·40
1 Alberta Red Winter.....	31,600·20	.....
2 Alberta Red Winter.....	35,964·30	22,061·50
3 Alberta Red Winter.....	2,986·50	272,607·50
4 Red Winter.....	.....	35,186·10
Winter Sundries.....	2,308·20	184,316·10
Rejected Mixed Heated.....	21,040·30	19,323·20
Condemned.....	2,709·20	3,087·20
No Established Grade.....	1,438·20	6,563·50
No. 2 Goose.....	.....	2,833·20
Dried 1 Northern.....	899·20	50,046·30
Dried 2 Northern.....	22,257·30	100,204·30
Grand Totals.....	52,700,640·20	163,172,882·50

NOTE.—The foregoing figures are the net bushels after all cleaning and drying operations have been taken to account. All tough or damp grain is transferred to straight grade after drying with the exception of 1 Northern and 2 Northern, which becomes Dried 1 Northern and Dried 2 Northern as above.

From the Office of the Statistician,
Fort William, Ont., April 6th, 1916.

(Sgd.) H. E. GORDON,
Statistician.

FLOUR AND BREAD

Canadian mills, on the average, produce a barrel of flour, which weighs 196 lbs. from four and a half bushels of wheat (270 lbs.). The remaining 74 lbs. is accounted for as follows: offal (shorts and bran) 70 lbs., and 4 lbs. of waste. In the days of early settlement there were only custom grist mills. In Upper Canada these were built by the British Government at water powers reserved by the State. King's Mills were located at Niagara Falls, Napanee, Kingston, and Gananoque. The settler took his wheat to the mill and received back flour for his family and some by-product for this stock, the milling being paid for in the toll. To-day there are in Canada about 1,100 mills, of which some 563 are merchant mills, with a total capacity of 111,415 barrels of flour a day. These merchant mills buy wheat and sell flour and offal. The Ogilvie Milling Company own and operate seven milling plants with a capacity of 18,000 barrels of flour per day and have about 140 elevators with a total storage for about four million bushels of grain. Other similar large milling companies are: Lake of the Woods Milling Co., Maple Leaf Milling Co., Western Canada Flour Mills Co., and St. Lawrence Milling Co.

These companies produce flour of different grades about as follows: 35% of top grade, 60% of intermediate grade, and 5% of low grade. Most of the top grade is sold in Canada for domestic use; the intermediate is used in part by Canadian bakers and the balance is exported. Canadians demand the highest grade, the whitest, and most expensive flour. The flour used in English bread-making is not as a rule so expensive as that used in Canada and it is not considered of as high grade. Whether the bread is any less valuable as a food is another question. Scottish and Irish breads are generally made from flour of higher grade than the English. Just as flour milling has developed from a simple process, involving much hand labour, to a complicated machine process, so has bread-making in Canadian cities changed to a machinery process. A barrel of flour on the average produces 260 pounds of bread. In ordinary years therefore a bushel of wheat (60 lbs.) will ultimately produce 58 pounds of bread and $15\frac{1}{2}$ pounds of shorts and bran. On account of its high quality western wheat will this year produce nearly 60 pounds of bread. The bushel of wheat costing the farmer in normal years 60 cents to produce will be turned into bread for which the city consumer will pay at least \$2.00.

The following table gives the prices per pound of bread in Toronto and in London, England:

	Toronto cents	London cents
July, 1914.....	$3\frac{1}{3}$ to 4	$2\frac{3}{4}$
September, 1914.....	$3\frac{1}{3}$ to 4	3
December, 1914.....	$3\frac{1}{3}$ to 4	$3\frac{1}{4}$
February, 1915.....	4	$3\frac{3}{4}$
April, 1915.....	4	4
June, 1915.....	4	$4\frac{1}{2}$
October, 1915.....	$3\frac{1}{3}$	$3\frac{3}{4}$ to 4
December, 1915.....	$3\frac{1}{3}$	4 to $4\frac{1}{4}$
January, 1916.....	$3\frac{1}{3}$ to 4	$4\frac{1}{4}$
February, 1916.....	$3\frac{1}{3}$ to 4	$4\frac{1}{2}$ to $4\frac{3}{4}$
March, 1916.....	$3\frac{1}{3}$	$4\frac{1}{2}$ to $4\frac{3}{4}$

In the first seven months of 1914 freight rates on wheat from New York to Liverpool varied from 2·75 cents to 5·50 cents per bushel; during August and September, 1914, they were 6·0 cents; in October, they increased to 8 cents. A gradual increase then took place, reaching 18 cents by the end of December. During the months of January to August, 1915, inclusive, they ranged from 18 to 24 cents. In September another increase started and during the last four months of 1915 they ranged from 24·30 cents to 40·60 cents. The average rate from New York was as follows: for the year 1912, 7·54 cents; for 1913, 5·54 cents; for 1914, 6·17 cents, and for 1915, 27·05 cents. At the end of December, 1915, the rate was 40·6 cents. At the same time the rate from India was 88 to 95 cents; from the Argentine, about 90 cents; and from Australia 50 cents for sailing vessels and 72 cents for steamers. (See *Agricultural War Book*, 1916, pp. 156-8.)

HISTORY OF RED FIFE AND MARQUIS WHEATS

In October, 1860, a Wisconsin farmer, J. W. Clarke, wrote a letter to "The Country Gentleman and Cultivator" calling attention to the high qualities of Red Fife wheat, and the success he had had in growing it. In that year his crop averaged thirty-six bushels to the acre, and he recommended it to replace winter wheat. He referred to its originator, Mr. David Fife, of Otonabee, Canada West. "The Canadian Agriculturist" reproduced Mr. Clarke's letter, and added an account of the origin of the Red Fife wheat, written by Mr. George Esson, a neighbor of Mr. Fife. The Fifes and the Essons came from Kincardine, Parish of Tullyallen,

Scotland, and settled in Otonabee, Peterboro county, Ontario, about 1821. Here is Mr. Esson's letter, which may be found in "The Canadian Agriculturist" for March, 1861 (p. 167).

"About the year 1842, Mr. David Fife, of the Township of Otonabee, Canada West (now Ontario), procured through a friend in Glasgow, Scotland, a quantity of wheat which had been obtained from a cargo direct from Dantzic. As it came to hand just before spring seed time, and not knowing whether it was a fall or spring variety, Mr. Fife concluded to sow part of it that spring, and wait for the result. It proved to be a fall wheat, as it never ripened, except three ears, which grew apparently from a single grain. These were preserved, and although sown the next year under very unfavorable circumstances being quite late, and in a shady place, it proved at harvest to be entirely free from rust, when all the wheat in the neighborhood was badly rusted. The produce of this was carefully preserved, and from it sprang the variety of wheat known over Canada and the Northern States by the different names of Fife, Scotch, and Glasgow. As the facts occurred in my immediate neighborhood, and being intimately acquainted, not only with the introducer, but with the circumstances, I can vouch for the correctness of the statement, and if necessary, produce incontestable proof."

But the story is not yet complete. In 1905, Dr. Chas. E. Saunders, Dominion Cerealist, in his evidence before the Parliamentary Committee on Agriculture and Colonization, referred to Mr. Esson's letter, and then added the following:

"This account has given rise to the idea that Red Fife is a Canadian wheat; that it originated with Mr. Fife in some wholly unaccountable manner or as a sport from some European variety. It always seemed to me probable that the kernel which Mr. Fife obtained was merely a seed of some common European variety which had found its way into this wheat from Dantzic. Last season, among our newly-imported European varieties, was one under the name of 'Galician' obtained from a seedsman in Germany. Now, Galicia lies about 300 miles inland from Dantzic. This imported Galician wheat struck me at once as being very much like Red Fife, and I therefore sowed it last spring alongside Red Fife, and watched them both very carefully throughout the season. They proved to be identical at all stages of their growth as well as when the grain was harvested. A larger plot of Galician wheat furnished grain for milling purposes. This was ground, analyzed, and baked. Red Fife from a plot in the same field was similarly treated. The two samples of flour were found to be alike in all respects, and thus the absolute identity of the two wheats was established. The firm from which the seed of the Galician wheat

was obtained, informed me that the variety was procured by them many years ago from a farmer in Galicia. It seems, therefore, quite clear that the kernel of wheat which came into the hands of Mr. Fife was a kernel of this Galician spring wheat, accidentally present in the cargo of winter wheat from Dantzic, of which he obtained a portion. It is interesting to be able to throw this light on the subject of the origin of Red Fife, which has hitherto seemed very dark. There is no doubt that this variety is still grown in Europe, and so far as our tests have gone, it seems to be of the same quality there as it is here."

And what of Marquis wheat? It is an offspring of Red Fife, having this old and trusty variety as its father and Hard Red Calcutta as its mother. Its story was told in the Annual Report of the Canadian Experimental Farms for 1913, pp. 118, 119.

"All the details in regard to the origin of Marquis are not available, but it is one of the descendants of a cross between an early-ripening Indian wheat, Hard Red Calcutta (as female) and Red Fife (as male). The cross, as appears from unpublished notes, was made by Dr. A. P. Saunders, probably at the Experimental Farm at Agassiz, in the year 1892. The cross-bred seeds, or their progeny, were transferred to Ottawa, and the writer of this report was appointed in 1903 to take charge of the work of cereal breeding. He made a series of selections from the progeny of all the cross-bred wheats which had been produced at Ottawa up to that time. Some of these had been named and others were under numbers. Though they had all been subjected to a certain amount of selection, each of them consisted of a mixture of related types. In some cases all the types present were similar. In other instances striking differences were observed. The grain which had descended from the cross referred to above was found by careful study of individual plants (especially by applying the chewing test to ascertain the gluten strength and probable bread-making value) to be a mixture of similar-looking varieties which differed radically in regard to gluten quality. One of the varieties isolated from this mixture was subsequently named Marquis. Its high bread-making strength and color of flour were demonstrated in the tests made at Ottawa in the early months of 1907, and all the surplus seed was at once sent to Indian Head Experimental Farm for propagation."

FIRST SHIPMENT OF WESTERN WHEAT

The records of the first shipments of Manitoba wheat to the East are worth preserving and, therefore, I append the following statement based on information mainly taken from *The Winnipeg Free Press* of October 23rd, 1876.

In 1876 spring wheat failed in Ontario, the old reliable Red Fife apparently had run out, or had lost its vigor. Perhaps the fault lay in the soil rather than in the grain. The Red River Valley Fife wheat had made a reputation, and so in the fall of the year the late Mr. R. C. Steele, of Steele Brothers, Toronto, started for Manitoba. He travelled by rail to St. Paul, and thence to Fisher's Landing, where, doubtful of the river navigation so late in the year, he took a lumber wagon and made the 150 miles to Winnipeg in thirty hours of continuous going. He wished to bring back 5,000 bushels, but all he was able to secure at Winnipeg was 857 bushels. This wheat came down to Toronto by steamer from Winnipeg to Fisher's Landing, where he secured some additional United States wheat, thence by rail to Duluth, by vessel Duluth to Sarnia, and by rail from Sarnia to Toronto. This was the first wheat exported from Manitoba to the east. It was in the latter part of October, 1876. Mr. Steele paid 85 cents per bushel for this wheat on the twelfth of October, 1876.

The purchase was made from Messrs. Higgins and Young, who collected the wheat from the following growers:

G. R. Miller.....	Kildonan.....	204	bushels
John McIvor.....	Greenwood.....	17 $\frac{3}{4}$	"
J. W. Carleton.....	Clear Spring.....	80 $\frac{1}{6}$	"
H. Soar.....	St. John.....	154	"
F. Dick.....	Springfield.....	35	"
Neil McLeod.....	Victoria.....	22	"
Black.....	Springfield.....	102	"
D. McDonald.....	Springfield.....	94	"
John Spear.....	Springfield.....	44	"
T. B. Robinson.....	Rockwood.....	32	"
Alex. Gibson.....	Springfield.....	33	"
John Reich.....	St. Paul.....	40	"

The consignment was shipped in twelve sacks and the freight charges Winnipeg to Toronto, were 35 cents a bushel.

The first shipment for export to Great Britain was made on 17th October, 1877, by Mr. Robert Gerrie. It was consigned to Barclay and Brand, Glasgow, Scotland, and went out via the United States. The following statement as to the first shipment abroad by the all-Canadian route has been furnished by Mr. Thompson, of Winnipeg, who, himself, made the shipment. He writes:—

"It has been claimed for us by earlier writer on the Manitoba Grain Trade, that we made the first *direct* shipment of wheat from Manitoba to the United Kingdom, but we regret to say we are not in a position either to confirm or deny the claim.

"In the year 1883 the writer was employed as bookkeeper with the party who operated the first grain elevator built in Brandon, Man., and in 1884 went into the grain business on his own account, and we were in Brandon till 1897 when we moved to Winnipeg.

"The shipment referred to was made about October, 1884. It consisted of a single carload of 1 Nor. Wheat, 667 bus., the largest capacity cars then being 40,000 lbs. The wheat was in sacks, and was shipped direct from Brandon by C. P. R., to Port Arthur (Fort William was not in existence then), thence by C.P.R. lakeboat to Owen Sound, then on to Montreal by C. P. R., and thence to Glasgow by an Allan Line boat. It was shipped on a through B/L issued by the C.P.R., and the most notable thing about it was that it left Brandon and was delivered in Glasgow in exactly twenty-one days. At that time such excellent despatch was something to speak about. We have no records now of the exact date of the shipment, or the price, and what we are giving you is from memory. We had for a year previous been shipping wheat in sacks to Ontario millers, and we had been keeping up a correspondence with friends in Glasgow (Messrs. Dunlop Brothers), about shipping wheat to them, and so when we made this shipment, there seemed nothing remarkable about it, or perhaps permanent records of particulars could have been preserved. During the years 1885 to 1892, we were continuous shippers of wheat in sacks to Glasgow and Liverpool. Ordinary two-bushel jute sacks were used, and when emptied the sacks were calendered, baled and returned to us. They made usually three to four trips back and forth, until they became too much worn, when they would be sold on the other side for about a fifth of what they cost originally. With the gradual increase in grain production, and the increase in country elevators and terminal facilities, and the inspection system, shipping in bulk became the practice, and the shipping in sacks became obsolete. It was a fine clean business, however, so long as it lasted.'

AN EXPERT ON THE 1915 CROP

Professor John Bracken, Professor of Field Husbandry of the University of Saskatchewan, Saskatoon, has given the writer of this paper his opinion on the main causes contributing to the large crop of 1915. From his report, based on experiment and observation, the following is abstracted. The specific question was as to the relative importance of the three factors, tillering, or number of heads per plant, size or length of heads, and weight or plumpness of grains in the head. He writes:—

"We believe that all three of the points you mention were increased in most fields in 1915 over the previous year. We think

the number of heads per plant was increased most where the conditions after seeding were favorable to abundant tillering, that the grains per head were increased more than either of the other two under conditions where, for some cause or other, tillering was hindered and fertilization of blossoms favored and, that the weight per grain was increased most where the conditions both at tillering and at blossoming were not ideal. In other words, at such time as the soil and climatic factors were favorable the plants made vigorous growth and this was evidenced in greater tillering, seed formation and better filling.

"If we were asked to venture an opinion as to the contribution of each of these factors to the 50 to 60 per cent average increase in yield in the 1915 crop over the 1914 one when sown under similar cultural conditions in our Investigation Field here, we should say 20% of it was expressed in greater tillering, 20% in more seeds per head and 15% in the size or weight of the kernels. Of course, the total increase was much greater in some other places than at Saskatoon, and no doubt the expression of the increase would be different also.

"Whether the evidence of the large yield is to be found in more heads per plant or more grains per head or heavier grains or in all of these, we are satisfied that the causes of the increase in any or all are to be attributed to several different factors among which are:

"(1) The heavy precipitation in the fall of 1914 which came too late to be seriously affected by evaporation and which encouraged fall tillage under soil conditions that were very much more favorable than in any other year in my experience.

"(2) The favorable seeding conditions in the spring of 1915.

"(3) The cool growing season until August. This fostered tillering and did not lessen fertilization of blossoms as does hot dry weather.

"(4) The later than usual summer rains which filled the grain better than our normal dry ripening seasons do.

"(5) The later date of the first fall frost in 1915 which permitted full maturity in nearly all districts.

"Other influencing factors no doubt were, (1) the extra tillage given in those areas where the crop was a partial failure in 1914 and in all parts where the 1914 crop was harvested early, and (2) the greater store of soluble or available plant food in the soil in the spring of 1915, as a result of the combination of the long autumn season of 1914, the small draft upon the soil by that year's crop and the abnormal fall rains preceding the 1915 crop.

"If you will chart the distribution of precipitation and the mean monthly temperature at some of the places southwest of this city for the past two years, you will find them a very interesting study in the light of the yields that were secured in that portion of the province. We think the rains that did not fall in the summer of 1914, but that did come in the autumn of that year, were the chief cause of the enormous difference in the yield of crops in western Saskatchewan in the past two years."

One table from Prof. Bracken's report is worth reproducing—it is the precipitation at Swift Current where crops were a failure in 1914 and most abundant in 1915.

MONTHLY PRECIPITATION AT SWIFT CURRENT

	Inches		Inches	Ten-year average
Sept. 1913	0.48	Sept. 1914	2.17	1.023
Oct. "	0.35	Oct. "	2.49	0.794
Nov. "	0.03	Nov. "	0.92	0.485
Dec. "	0.04	Dec. "	0.97	0.539
Jan. 1914	0.61	Jan. 1915	0.48	0.540
Feb. "	0.38	Feb. "	0.16	0.520
March "	0.79	March "	0.10	0.660
April "	0.40	April "	0.00	0.660
Total	3.08		7.29	5.221
May 1914	0.17	May 1915	4.29	1.814
June "	2.31	June "	2.72	3.417
July "	0.76	July "	2.37	2.075
August "	0.51	August "	0.76	1.762
Total	3.75		10.14	9.068

"From the above it will be seen that for the eight months preceding the crop season of 1914 the precipitation was 2.14 inches below the average of the ten years; that during the four months of the crop growing period the precipitation was 5.32 inches below the average; that the 1914 crop was followed by a precipitation 2.07 inches above the average; that the spring of 1915 was comparatively dry and the crop growing period of that year had a precipitation of 1.07 inches above the average. In other words the rains of both 1914 and 1915 were all favorable for the crop of 1915.

“The temperatures were more favorable in 1915 than in 1914 for filling and maturing the grains—lower in June and July and higher in August as may be seen from the following:

Swift Current			Saskatoon		
	1914	1915		1914	1915
	deg.	deg.		deg.	deg.
May	52·8	52·3	May	50·7	52·7
June	60·1	55·8	June	59·6	55·9
July	72·5	60·0	July	69·7	59·0
August	63·4	67·0	August	61·7	66·0



Mémoires de la Société Royale du Canada

SECTION I

SÉRIE III

SEPTEMBRE 1916

VOL. X

La prévôté de Québec

PAR PIERRE-GEORGES ROY, M.S.R.C.

(Lu à la réunion de mai 1916)

Le trente-unième article de l'Édit de création de la Compagnie des Indes Occidentales donné à Paris au mois de mai 1664, se lisait comme suit:

"Pourra la dite compagnie comme seigneurs haut-justiciers de tous les dits pays, établir des juges et officiers partout où besoin sera et où elle trouvera à propos de les déposer et destituer, quand bon lui semblera, lesquels connaîtront de toutes affaires de justice, police, commerce, navigation tant civiles que criminelles; où il sera besoin d'établir des conseils souverains, les officiers dont ils seront composés, nous seront nommés et présentés par les directeurs généraux de la dite compagnie; et sur les dites nominations les provisions seront expédiées."¹

C'est sur l'autorité de cet article de son édit de création que la Compagnie des Indes Occidentales établit le tribunal de la Prévôté de Québec au mois de mai 1666.

En décembre 1674, par un édit donné à Saint-Germain-en-Laye, Louis XIV réunissait au domaine de la couronne toutes les terres qu'il avait ci-devant accordées à la Compagnie des Indes Occidentales. Par le même édit le roi révoquait, éteignait et supprimait le siège de la Prévôté et Justice ordinaire de Québec, et il ordonnait que le Conseil Souverain jugerait en première instance les procès et contestations que la Prévôté avait coutume de juger et dont l'appel était relevé au Conseil Souverain.²

Par son édit donné à Saint-Omer au mois de mai 1677, Louis XIV rétablissait le siège de la Prévôté et Justice ordinaire de Québec "pour connaître en première instance de toutes matières tant civiles que criminelles, et dont l'appel sera relevé en notre Conseil Souverain établi en la dite ville."

¹ Édits et Ordonnances, vol. I, p. 46.

² Cet édit a été publié dans les Édits et Ordonnances, vol. I, p. 74.

Le siège de la Prévôté devait être composé d'un lieutenant-général, d'un procureur du roi et d'un greffier. Le lieutenant-général devait recevoir cinq cents livres de gages, le procureur du roi trois cents livres et le greffier cent livres.¹

C'est ce tribunal de la Prévôté réorganisé en 1677 qui a existé jusqu'à la conquête.

Nous donnons ici la liste des lieutenants-généraux, lieutenants particuliers, procureurs du roi et greffiers de la Prévôté de Québec de 1666 à 1759.

LIEUTENANTS-GÉNÉRAUX CIVILS ET CRIMINELS

LOUIS-THÉANDRE CHARTIER DE LOTBINIÈRE

Nommé le 1er mai 1666, par la Compagnie des Indes Occidentales.² Installé par le Conseil Souverain le 10 janvier 1667. Le 26 avril 1675, M. de Lotbinière obtenait de nouvelles lettres de provisions mais cette fois du roi.³ Le 1er mai 1677, M. de Lotbinière résignait sa charge en faveur de son fils. À l'automne de 1679, il s'embarqua pour la France. Il mourut au cours de ce voyage ou du moins ne revint pas dans la Nouvelle-France. Mgr Tanguay fait mourir M. de Lotbinière à Québec le 11 septembre 1690.⁴ C'est Mme de Lotbinière qui meurt à Québec à cette date.⁵

RENÉ-LOUIS CHARTIER DE LOTBINIÈRE

Nommé le 1er mai 1677.⁶ Installé le 25 octobre 1677. Le 1er juin 1703, M. de Lotbinière était nommé premier conseiller du Conseil Souverain. Il fut installé le 26 novembre 1703, dans sa nouvelle charge. M. de Lotbinière décéda à Québec le 3 juin 1709.⁷

CLAUDE BERMEN DE LA MARTINIÈRE

Nommé le 12 juin 1703.⁸ Installé le 26 novembre 1703. Le 5 mai 1710, M. de la Martinière remplaçait M. de Lotbinière au Conseil Souverain en qualité de premier conseiller. Il fut installé le 6 octobre

¹ L'édit pour l'établissement du siège de la Prévôté et Justice ordinaire de Québec de mai 1677 a été publié dans les Édits et Ordonnances, vol. I, p. 90.

² Lettres de provisions dans Édits et Ordonnances, vol. III, p. 87.

³ Lettres de provisions dans Cahier 1 des Insinuations du Conseil Supérieur.

⁴ Dictionnaire généalogique, vol. 1er, p. 120.

⁵ Pour renseignements biographiques sur M. de Lotbinière, voir Pierre-Georges Roy, *La Famille Chartier de Lotbinière*.

⁶ Lettres de provisions dans Cahier 1 des Insinuations du Conseil Supérieur.

⁷ Pour renseignements biographiques sur M. de Lotbinière, voir Pierre-Georges Roy, *la Famille Chartier de Lotbinière*.

⁸ Lettres de provisions dans Cahier 3 des Insinuations du Conseil Supérieur.

1710. Il avait été lieutenant-général de la Prévôté pendant sept ans. Décédé à Québec le 14 avril 1714.¹

DENIS RIVERIN

Nommé le 17 janvier 1710. Ses lettres de provisions ne furent jamais enregistrées ni même présentées au Conseil Souverain. M. Riverin avait été nommé, le 27 octobre 1702, député du Canada en France pour surveiller les intérêts des habitants au sujet du commerce du castor. Il vivait donc en France depuis près de huit ans lorsqu'il fut nommé lieutenant-général de la Prévôté de Québec. Il n'accepta cette charge que pour en retirer les émoluments, puisque le 5 mai 1710, le roi nommait le sieur Paul Dupuy de Lislois pour faire les fonctions de lieutenant-général de la Prévôté de Québec en l'absence du sieur Riverin. Et, un peu plus tard, le roi décidait que "M. Riverin, ne pouvant être en même temps en France pour y faire ses fonctions de la députation, et au Canada pour se faire recevoir en la dite qualité de lieutenant-général, devait, en considération de ce service, être payé de ses appointements de la dite charge par le fermier du Domaine d'Occident." M. Riverin mourut en France en 1717. Il conserva sa charge jusqu'à sa mort sans l'avoir jamais exercée.²

PIERRE ANDRÉ DE LEIGNE

Nommé le 13 avril 1717.³ En 1742, après un quart de siècles de services, M. André de Leigne demanda à prendre sa retraite tout en conservant ses appointements. Au mois de mars 1744, le roi lui accordait la permission de se retirer du service avec la jouissance de son plein salaire. M. André de Leigne décéda à Trois-Rivières le 7 mars 1748.⁴

FRANÇOIS DAINE

Nommé le 25 mars 1744.⁵ Il exerça sa charge jusqu'à la conquête. M. Daine fut donc le dernier lieutenant-général de la Prévôté de Québec. Nous voyons dans la *Gazette de Québec* que le 20 septembre 1764 M. Daine, sa femme et ses deux filles Gillette et Françoise s'embarquaient pour la France. Ils ne revinrent pas.⁶

¹ Pour renseignements biographiques sur M. de la Martinière, voir J-Edmond Roy, Claude de Bermen, sieur de la Martinière.

² Pour renseignements biographiques sur M. Riverin, voir Ignotus, La Presse.

³ Lettres de provisions dans Cahier 5 des Insinuations du Conseil Supérieur.

⁴ Pour renseignements biographiques sur M. de Leigne, voir Benjamin Sulte, *Nouvelles Soirées Canadiennes*, 1888, p. 289.

⁵ Lettres de provisions dans *Édits et Ordonnances*, vol. III, p. 107.

⁶ Pour renseignements biographiques sur M. Daine, voir Ignotus, La Presse.

LIEUTENANTS—PARTICULIERS

Le 6 octobre 1685, l'intendant de Meulles demandait au ministre de Seignelay de nommer à Québec un lieutenant particulier de le Prévôté. Il proposait pour remplir cet office Augustin Rouer de la Cardonnière, fils aîné de M. Rouer de Villeray, premier conseiller au Conseil Souverain.¹

Le ministre ne se rendit pas à la demande de M. de Meulles.

Neuf ans plus tard, le 24 octobre 1694, l'intendant Champigny insistait à son tour pour obtenir la nomination d'un lieutenant-particulier de la Prévôté à Québec.² Cette fois le ministre se décida à agir. Le premier titulaire fut:

PAUL DUPUY DE LISLOIS

Nommé le 1er juin 1695.³ Le 5 mai 1710, un arrêt du roi nommait M. Dupuy de Lislois pour faire les fonctions de lieutenant-général de la Prévôté de Québec, en l'absence du sieur Riverin. M. Dupuy agit ainsi comme lieutenant-général jusqu'à sa mort arrivée à Québec le 20 décembre 1713.⁴

JEAN-FRANÇOIS HAZEUR

Nommé le 5 mai 1710.⁵ Sa nomination au Conseil Souverain le 18 juin 1712, lui fit abandonner la charge de lieutenant-particulier.⁶

LOUIS ROUER D'ARTIGNY

Nommé le 18 juin 1712.⁷ Le 3 avril 1717, M. Rouer d'Artigny entra à son tour au Conseil Souverain.⁸

¹ Le mémoire envoyé à M. de Seignelay par l'intendant de Meulles se trouve au volume 7 de la Correspondance générale, aux Archives du Canada, à Ottawa.

² Archives du Canada, Correspondance générale, vol. 13.

³ Lettres de provisions dans Cahier 3 des Insinuations du Conseil Supérieur.

⁴ Pour renseignements biographiques sur M. Dupuy de Lislois, voir N. E. Dionne, *Sainte-Anne de la Pocatière; l'Ile-aux-Oies*, pp. 173 et seq.

⁵ Lettres de provisions dans Cahier 3 des Insinuations du Conseil Supérieur.

⁶ Pour renseignements biographiques sur M. Hazeur, voir l'abbé Auguste Gosselin, *L'Église du Canada*, vol. II, p. 39.

⁷ Lettres de provisions dans Cahier 3 des Insinuations du Conseil Supérieur.

⁸ Pour renseignements biographiques sur M. Rouer d'Artigny, voir Pierre-Georges Roy, *La Famille Rouer de Villeray*.

JEAN-BAPTISTE COUILLARD DE LESPINAY

Nommé le 27 avril 1716.¹ M. de Lespinay décéda à Québec le 8 mars 1735.²

NICOLAS-GASPARD BOUCAULT

Nommé le 27 mars 1736.³ En 1757, M. Boucault abandonnait sa charge pour retourner en France.⁴

GUILLAUME GUILLIMIN

Nommé le 24 avril 1757.⁵ Installé le 10 juillet 1758. Il fut le dernier lieutenant-particulier de la Prévôté de Québec. Décédé à Québec le 30 juillet 1771.⁶

PROCUREURS DU ROI

JEAN-BAPTISTE PEUVRET DE MESNU

Le 1er mai 1666, la Compagnie des Indes Occidentales donnait l'office de procureur fiscal en la ville de Québec à Jean-Baptiste Peuvret de Mesnu.⁷ M. Peuvret de Mesnu exerça cette charge, concurremment avec son office de greffier du Conseil Souverain, jusqu'à la révocation par le roi de la Compagnie des Indes Occidentales.⁸

LOUIS BOLDUC

Louis Bolduc, qui succéda à Jean-Baptiste Peuvret de Mesnu dans la charge de procureur du Roi de la Prévôté de Québec, fut nommé le 16 août 1676.⁹ Il fut le premier procureur de la Prévôté nommé directement par le roi. Bolduc fut interdit par le Conseil

¹ Lettres de provisions dans Cahier 4 des Insinuations du Conseil Supérieur.

² Pour renseignements biographiques sur M. Couillard de Lespinay, voir Pierre-Georges Roy, *La Famille de Chavigny de la Chevrotière*, pp. 134 et seq.

³ Lettres de provisions dans Édits et Ordonnances, vol. III, p. 103.

⁴ Pour renseignements biographiques sur M. Boucault, voir *Bulletin des Recherches Historiques*, vol. III, p. 25.

⁵ Lettres de provisions dans Cahier 10 des Insinuations du Conseil Supérieur.

⁶ Pour renseignements biographiques sur M. Guillimin, voir Pierre-Georges Roy, *la Famille Guillimin*.

⁷ Lettres de provisions dans Édits et Ordonnances, vol. III, p. 86.

⁸ Pendant un voyage que M. Peuvret de Mesnu fit en France, il fut remplacé dans sa charge de procureur du roi par Pierre Duquet de la Chesnaye—Jugements et Délibérations du Conseil Souverain, vol. II, p. 559. Pour renseignements biographiques sur M. Peuvret de Mesnu, voir J-Edmond Roy, *Histoire du Notariat au Canada*, vol. 1er.

⁹ Lettres de provisions dans cahier 1 des Insinuations de la Prévôté de Québec.

Souverain, le 30 avril 1681. Malgré l'intervention énergique de Frontenac en sa faveur, il fut cassé par le roi le 4 juin 1686.¹

PIERRE DUQUET DE LA CHESNAYE

Commis par le Conseil Souverain, le 30 avril 1681, pour faire les fonctions de la charge de procureur du roi en la prévôté de Québec "jusqu'à ce que Louis Bolduc se soit purgé des cas à lui imposés."² Duquet exerça les fonctions de procureur du roi jusqu'à la nomination de Paul Dupuy de Lislois par MM. de Denonville et Champigny, le 24 octobre 1686.

PAUL DUPUY DE LISLOIS

Nommé le 17 octobre 1686.³ Le 1er juin 1695, il était promu lieutenant-particulier de la Prévôté.

JEAN-BAPTISTE BÉCARD DE GRANDVILLE

Nommé le 1er juin 1695.⁴ Décédé à Québec le 23 avril 1699.⁵

CHARLES BÉCARD DE GRANDVILLE

Nommé le 20 avril 1700.⁶ Décédé à Québec, le 2 janvier 1703.⁷

¹ Lettres de destitution dans Cahier 2 des Insinuations du Conseil Supérieur. Pour renseignements biographiques sur M. Bolduc, voir Bulletin des Recherches Historiques, vol. XXII, p. 65.

² Jugements et Délibérations du Conseil Souverain, vol. II, p. 559.

³ Lettres de provisions dans Cahier 2 des Insinuations du Conseil Supérieur. Le 24 octobre 1686, MM. de Denonville et Champigny donnaient une commission à M. Dupuy de Lislois, ignorant que ses lettres de provisions avaient été signées par le roi le 17 du même mois.

⁴ Lettres de provisions dans Cahier 2 des Insinuations du Conseil Supérieur.

⁵ Pour renseignements biographiques sur Jean-Baptiste Bécard de Grandville voir Pierre-Georges Roy, La Famille Bécard de Grandville.

⁶ Lettres de provisions dans Cahier 2 des Insinuations du Conseil Supérieur.

⁷ Le 4 avril 1703, M. R.-L. Chartier de Lotbinière signait la commission suivante: "Estant nécessaire de commettre un substitut du procureur du roy à cause du deceds de deffunt Me Charles Bécard escuier sieur de Fonville dernier titulaire du dit office de procureur du roy de cette prevosté et après avoir par diverses fois parlé à Messire François de Beauharnois, chevalier, seigneur de la Chaussée, Beaumont et autres lieux, conseiller du roy en ses Conseils, intendant de justice police et finances en la Nouvelle-France, lequel nous aurait dit de commettre tel praticien de ce siège que nous en jugerions capable; et ne pouvant d'ailleurs nous empêcher de commettre au dit office attendu les diverses affaires qui commencent à se présenter depuis la cessation de la maladie qui a affligée cette ville et mesme toute cette juridiction, nous avons commis la personne de Joseph . . . huissier audiencier pour exercer la dite charge en qualité de substitut jusqu'à ce qu'il y soit autrement pourvu." Pour renseignements biographiques sur Charles Bécard de Grandville, voir Pierre-Georges Roy, La Famille Bécard de Grandville.

THIERRY

C'est le sieur Thierry, un Français de France, qui remplaça Charles Bécard de Grandville comme procureur du roi à la Prévôté. Il fut nommé par le roi en 1704. Thierry devait passer dans la Nouvelle-France par les vaisseaux de 1705, mais la maladie le retint là-bas. Finalement il décida de ne pas accepter la charge. Ce qui explique qu'on ne trouve ses lettres de provisions ni aux Insinuations du Conseil Supérieur ni aux Insinuations de la Prévôté.¹

JEAN-BAPTISTE COUILLARD DE LESPINAY

Le 10 octobre 1705, l'intendant Raudot donnait une commission de procureur du roi de la Prévôté de Québec à Jean-Baptiste Couillard de Lespinay.² Il est dit dans cette commission: "Sa Majesté ayant cy-devant pourvu de la charge du procureur du roy de la prévôté et amirauté de Québec la personne du sr Thierry que la maladie qui luy est survenue en France avant le départ des vaisseaux de ce pais a empesché de passer cette année, qu'il est cependant nécessaire de pourvoir d'une personne capable d'en faire les fonctions en son absence." Le 9 juin 1708, M. Couillard de Lespinay était nommé par le roi.³ Promu lieutenant-particulier le 27 avril 1716.⁴

JEAN-FRANÇOIS MARTIN DE LINO

Nommé le 27 avril 1716.⁵ Décédé à Québec le 5 janvier 1721.⁶

¹ Le 9 juin 1706, le ministre écrivait à M. d'Auteuil qu'il avait donné la charge de procureur du roi de la Prévôté au sieur Thierry, M. de Lespinay étant beau-frère du lieutenant-particulier—Édouard Richard, *Supplément du Rapport du Dr Brymner sur les Archives Canadiennes*, 1899, p. 378.

² Ordonnances des Intendants, cahier 1, p. 4.

³ Lettres de provisions dans Cahier 3 des Insinuations du Conseil Supérieur.

⁴ Le 22 juin 1716, l'intendant Bégon donnait une commission de substitut du procureur du roi en la prévôté de Québec au sieur Pierre Haimard, juge prévôt de Notre-Dame des Anges. Il était dit dans cette commission: "Sur ce qui nous a été représenté qu'il serait nécessaire de commettre une personne pour faire les fonctions de commis et procureur du roi au siège de la prévôté et amirauté de cette ville pour en l'absence du sieur de Lespinay procureur du roi au dit siège ou lorsqu'il s'abstiendra de la connaissance des affaires y pendantes soit à cause de la parenté ou autrement y faire les fonctions de procureur du roi et même en cas d'absence ou révocation du sieur d'Artigny faire les fonctions de lieutenant particulier et du d. sieur de Lespinay y faire les d. fonctions de lieutenant particulier, à quoi ayant égard."

⁵ Lettres de provisions dans Cahier 4 des Insinuations du Conseil Supérieur.

⁶ Pour renseignements biographiques sur M. de Lino, voir *Bulletin des Recherches Historiques*, vol. XXI, p. 156.

JEAN-BAPTISTE-JULIEN HAMARD DE LA BORDE

Nommé le 10 février 1722.¹ M. Hamard de la Borde quitta la Nouvelle-France en octobre, 1726.²

NICOLAS-GASPARD BOUCAULT

Nommé le 20 avril 1728.³ Promu lieutenant-particulier le 27 mars 1736.

HENRI HICHÉ

Nommé le 27 mars 1736.⁴ Nommé conseiller au Conseil Supérieur le 15 mai 1754.⁵

IGNACE PERTHUIS

Nommé le 1er avril 1754.⁶ M. Perthuis fut le dernier procureur du roi de la Prévôté de Québec. Il s'en alla en France après la conquête.

GREFFIERS

GILLES RAGEOT

Nommé le 5 mai 1666, par la Compagnie des Indes Occidentales.⁷ Installé par le Conseil Souverain le 14 février 1667. Le 17 mai 1675, le roi accordait à M. Rageot l'assurance de son office de greffier de la Prévôté.⁸ Il y avait près de vingt ans que M. Rageot exerçait ses fonctions de greffier de la Prévôté lorsque, le 10 mars 1685, on lui donna comme successeur François Genaple de Bellefonds, sous prétexte que ses infirmités l'empêchaient de remplir sa charge convenablement. Rageot se défendit énergiquement. Finalement, le 24 septembre 1686, M. Rageot présentait au Conseil les nouvelles lettres de provisions qui lui avaient été accordées par le roi le 29 mai 1686.⁹ M. Rageot mourut à Québec le 3 janvier 1692.¹⁰

¹ Lettre de provisions dans Cahier 5 des Insinuations du Conseil Supérieur.

² Le 28 septembre 1726, l'intendant Dupuy donnait une commission à Henri Hiché pour faire les fonctions de procureur de la Prévôté: "pour l'absence prochaine du s. Hamard de la Borde, lequel ayant obtenu de sa majesté la permission de passer en France pour ses affaires, est sur le point de s'embarquer sur le vaisseau du Roy l'Éléphant."

³ Lettres de provisions dans Édits et Ordonnances, vol. III, p. 98.

⁴ Lettres de provisions dans Cahier 8 des Insinuations du Conseil Supérieur.

⁵ Pour renseignements biographiques sur M. Hiché, voir Monseigneur de Saint-Vallier et l'Hôpital-Général de Québec, p. 615.

⁶ Lettres de provisions dans Cahier 10 des Insinuations du Conseil Supérieur. Le 23 novembre 1753, M. Perthuis avait reçu des lettres de substitut du procureur du roi (Édits et Ordonnances, vol. III, p. 112).

⁷ Lettres de provisions dans Cahier 1 des Insinuations du Conseil Supérieur.

⁸ Lettres de provisions dans Cahier 1 des Insinuations du Conseil Supérieur.

⁹ Cahier 2 des Insinuations du Conseil Supérieur.

¹⁰ Pour renseignements biographiques sur M. Rageot, voir J.-Edmond Roy, Histoire du Notariat au Canada, vol. 1er, pp. 104 et seq.

CHARLES RAGEOT DE SAINT-LUC

Nommé le 1er mars 1693.¹ M. Rageot de Saint-Luc décéda à Québec le 18 décembre 1702.

NICOLAS RAGEOT DE SAINT-LUC

Nommé le 1703. Nous croyons que Nicolas Rageot de Saint-Luc n'obtint pas de lettres de provisions du roi. Il fut probablement nommé par l'intendant, à la mort de son frère, pour exercer les fonctions de greffier en attendant le bon plaisir du roi. Il décéda à Québec le 31 mars 1703, quelques semaines à peine après son entrée en fonctions, et avant d'avoir pu obtenir des lettres de provisions du roi.

FRANÇOIS RAGEOT DE BEURIVAGE

Nommé le 1er juin 1704.² Installé le 16 novembre 1705. Il exerça la charge de greffier très peu de temps, tout au plus un an. Le notaire François Rageot de Beurivage décéda à Saint-Thomas (Montmagny) le 16 avril 1754.³

FLORENT DE LA CETIÈRE

Le successeur de François Rageot de Beurivage comme greffier de la Prévôté fut le notaire Florent de la Cetière. On ne trouve ses lettres de provisions nulle part. Ce qui nous permet de supposer qu'il fut nommé par l'intendant, en attendant le bon plaisir du roi. Il fut interdit par l'intendant Raudot le 10 novembre 1707, sur l'ordre positif de Sa Majesté.⁴

PIERRE RIVET CAVELIER

Le 10 novembre 1707, le jour même de l'interdiction de Florent de la Cetière, l'intendant Raudot commettait Pierre Rivet Cavalier pour agir comme greffier de la Prévôté en attendant le bon plaisir

¹ Lettres de provisions dans Cahier 2 des Insinuations du Conseil Supérieur.

² Lettres de provisions dans Cahier 2 des Insinuations du Conseil Supérieur.

³ Pour renseignements biographiques sur les trois frères Rageot qui exercèrent successivement la charge de greffier de la Prévôté de Québec, voir J.-Edmond Roy, *Histoire du Notariat au Canada*, vol. 1er.

⁴ Le 6 juin 1708, le ministre écrivait à M. de la Martinière, lieutenant-général de la Prévôté, qu'il devait vivre dans la subordination qu'il devait à M. Raudot et devait renvoyer son greffier la Cetière, "comme il en avait été décidé." La chose était faite depuis plus de six mois. Pour renseignements biographiques sur Florent de la Cetière, voir J.-Edmond Roy, *Histoire du Notariat au Canada*, vol. 1er.

dù roi.¹ Pierre Rivet Cavelier fut nommé définitivement à cette charge le 7 juillet 1711.² Le 1er juin 1713, M. de Monseignat nommait sous le bon plaisir du Conseil le sieur Rivet Cavelier pour faire en son absence les fonctions de greffier du Conseil Supérieur. À la mort de M. de Monseignat, M. Rivet Cavelier lui succéda.

RENÉ HUBERT

Nommé "sous le bon plaisir de Sa Majesté" le 17 septembre 1714 par l'intendant Bégon, à cause de la démission du sieur Rivet.³ Nous n'avons pu retrouver les lettres de provisions du roi nommant René Hubert à la charge de greffier de la Prévôté de Québec. René Hubert décéda à Québec le 31 août 1725.

JACQUES BARBEL

Le 31 août 1725, jour de la mort du greffier René Hubert, l'intendant Bégon donnait une commission au notaire Jacques Barbel pour faire les fonctions de greffier de la prévôté de Québec "sous le bon plaisir du roi."⁴

NICOLAS BOISSEAU

Nommé le 23 avril 1726.⁵ Promu greffier du Conseil Supérieur le 25 mars 1744. Décédé à Québec le 9 février 1771.⁶

NICOLAS-GASPARD BOISSEAU

Nommé le 25 mars 1744.⁷ Il fut le dernier greffier de la Prévôté. Décédé à Saint-Thomas de Montmagny le 27 mai 1804.⁸

PIERRE GEORGES ROY

¹ Ordonnances des Intendants, cahier 1. Le 22 octobre 1709, l'intendant Raudot donnait commission à Coignet pour faire les fonctions de greffier de la prévôté de Québec en l'absence et pendant la maladie de Rivet, greffier. (Insinuations de la prévôté de Québec).

² Lettres de provisions dans Cahier 2 des Insinuations du Conseil Supérieur.

³ Commission dans Cahier 2 des Insinuations de la Prévôté de Québec.

⁴ Commission dans cahier 11 des Ordonnances des intendants.

⁵ Lettres de provisions dans cahier 6 des Insinuations du Conseil Supérieur.

⁶ Pour renseignements biographiques sur Nicolas Boisseau, voir Pierre-Georges Roy, *La Famille Boisseau*.

⁷ Lettres de provisions dans Cahier 9 des Insinuations du Conseil Supérieur.

⁸ Pour renseignements biographiques sur Nicolas-Gaspard Boisseau, voir Pierre-Georges Roy, *La Famille Boisseau*.

Au pays natal de Lamartine.

PAR ERNEST CHOQUETTE, M.S.R.C.

(Lu à la réunion de mai 1916).

C'est toujours sous la forme d'un personnage de rêve que je me suis représenté Lamartine.

Je me souviens, je fréquentais encore l'école quand je commençai de le connaître par un petit recueil qu'il avait lui-même tiré des pièces les plus charmantes de ses œuvres. La première page, je la revois encore, s'ouvrait sur la ravissante poésie: "*La prière de l'enfant à son réveil.*"

Il y parlait longuement de sa maison natale de Milly, de son foyer, de sa mère; il y racontait ses courses à travers bois, avec ses chiens, son fusil et ses livres; il y chantait les laboureurs, les moissons mûres, les coteaux et les clochers voisins.

Et tout cela c'était si bien "comme chez nous"; j'y retrouvais partout une telle image de la nature de mon propre pays et une telle conformité paysanne et naïve avec mes propres goûts que je fus empoigné dès ma plus lointaine enfance.

"Je suis né parmi les pasteurs." disait-il quelque part, et tout ce que ses chants agrestes éveillaient dans mon âme c'était l'écho des lentes mélodies campagnardes que j'entendais moi-même si souvent le soir, à l'heure du retour du champ.

"Je suis né parmi les pasteurs." Combien ne l'ai-je pas aimé à cause de ce simple vers! Aussi, sans vouloir tenir compte de mes impressions personnelles, il me semble toujours que ce qui demeurera le plus longtemps de son œuvre sera justement la partie qu'il a consacrée à rappeler ses souvenirs d'adolescence, son pays natal, les inoubliables spectacles de la vie des champs.

En tous cas c'est assurément là qu'il a puisé la berceuse rêverie qu'il a mêlée à ses *Harmonies*, ses *Méditations* ses *Confidences* et qui les imprègne d'un charme si pénétrant.

"Je suis né parmi les pasteurs." Comme elle est déjà éloignée n'est-ce pas, l'époque où je subissais si vivement l'attrait de ce rythme calme et doux, tranquille et régulier comme les guérets de mon pays. De nombreuses années ont passé depuis; d'autres amitiés littéraires, changeantes comme toutes les amitiés humaines, avaient paru se substituer à celles que j'entretenais pour Lamartine. Je croyais l'avoir oublié, lui et l'attendrissante magie de son style.

—Né à Bussières, dites-vous ?

—Oui, Bussières.

—Bussières ? Existe-t-il un endroit de ce nom dans notre pays ?

—Oh, non, reprit-il vivement Bussières, en France.

—En France ? Vous êtes donc Français.

—Mais oui je suis Français.

C'est moi qui interrogeais et c'est lui qui répondait : ce Perraud, venu de la paroisse voisine pour subir l'examen médical requis par les compagnies d'assurance et dont l'accent et le nom, plutôt canadiens me déroutaient.

—De quel département êtes-vous ?

—De Saone et Loire du Maconnais.

—Du pays de Lamartine alors ? Avez-vous déjà entendu son nom ?

Je ne sais pourquoi, j'avais tout de suite déposé ma plume.

—Ah ! oui, bien souvent, s'empressa-t-il de répondre. Il faisait des livres, n'est-ce pas ? Bussières, c'est une commune voisine de Milly qu'il habitait et où on lui a érigé une statue. L'on y conserve encore en souvenir sa maison natale C'était un grand homme, il paraît Moi, je ne l'ai pas connu, mais mon père, qui a été de longues années à son service Qui est-ce qui vous en a parlé ? Est-il déjà venu au Canada ?

Je ne pensai pas à répondre et reprenant à le questionner :

—Vous rappelez-vous l'abbé Dumont ? Pierre des Huttes ?

Non, il ne se rappelait pas.

—Êtes-vous allé à Monceau, à Saint-Point ?

—Ah ! très souvent. Ça se touche, voyez-vous, toutes ces communes-là.

—Et y a-t-il toujours un tailleur de pierres à Milly ? des platanes le long des routes un grand mur autour du jardin de Lamartine un lierre, près de la maison ?

—Mais qui vous a décrit ça, reprit-il, une douce flamme de nostalgie subite dans les prunelles. Il ne pouvait s'expliquer—je le voyais bien à ses grands yeux étonnés de paysan—comment j'avais réussi à obtenir de si minutieux renseignements sur son propre pays.

Je me remis à l'interroger :

—Et le père Dutemps, l'aveugle, habite-t-il encore avec sa fille la Marguerite ? Qui est-ce qui cultive aujourd'hui la colline ? Y a-t-il toujours un lavoir public au torrent de Milly ? Je reconstituais ainsi ses vieux souvenirs, corrigeant parfois certains détails qu'il me donnait.

Tout-à-coup il posa longuement son regard sur moi, comme avec un air de vouloir me demander des nouvelles de ses amis de Bussières. Pourquoi n'en aurais-je pas aussi ?

Et nous sommes restés rêveurs, émus tous les deux ; lui, parce que je venais de réveiller dans son cœur le doux nom de sa lointaine terre natale, le tableau revêcu de son enfance, ses camarades de là-bas, des arbres sur la colline, une mèche blonde d'amoureuse peut-être ; moi, seulement parcequ'il avait vu ce lierre et ces vignes et ces routes sablonneuses et tous ces lieux que Lamartine avait si divinement aimés et chantés. . . .

Et c'est alors que je perçus par quelles fibres profondes il continuait toujours de me tenir.

* * *

Qui d'entre-vous, en effet, qui connaissez l'ensorcelante séduction des lettres, n'a pas, un jour lointain de jeunesse, soudainement été subjugué par un livre, par une page de livre, par un chant, dont il a commencé tout bas à aimer l'auteur et à en subir le charme attirant, jusqu'au point d'en retenir éternellement le souvenir dans sa pensée ? Aucun, je le sais. Alors vous comprendrez, si de plus vous avez l'âme un peu rurale, que je n'aie pu résister, au cours d'une tournée d'Europe, à la hantise de visiter le pays natal de Lamartine.

—Vous descendrez à Macon," m'avait-on dit. "Vous prendrez là un tronçon de chemin de fer qui vous transportera à travers le Maconnais et vous déposera à la gare de la Roche Vineuse. C'est un petit hameau situé tout près de Milly."

Milly, le Maconnais, la Roche Vineuse . . . quelle capiteuse suavité, n'est-ce pas, rien que dans ces noms qui embaument le vin et la poésie et qui déjà vous enivrent.

Peut-être est-ce même pour me laisser davantage à cet enivrement que, en dépit de l'entente arrêtée la veille, le chef d'hôtel jugea préférable de ne m'éveiller qu'à sept heures précises, alors que le départ du train pour Milly avait lieu à sept heures et douze. Mais, si vous n'en avez pas déjà fait l'expérience, retenez bien ceci : n'abandonnez jamais la partie, croyez-moi, malgré l'in vraisemblable brièveté du temps qui en pareilles circonstances peut rester à votre disposition. Car il est impossible à un cerveau non averti de concevoir ce qu'un voyageur alerte et tenace peut, en douze minutes, empiler de chemises, enjamber d'escaliers et égrener de bêtises sur la tête du chef d'hôtel, en passant.

. . . Un impressionnant soleil d'automne avait doucement commencé de dorer les choses, d'empourprer les vignes et la crête des collines, à cette heure matutinale où le train—rustique lui-même

comme tout ce qui l'entourait—nous emporta en pleine campagne française.

Jusque là, j'avais parcouru la France en wagons luxueux, chargés de cosmopolites qui enjambaient comme moi d'une ville à l'autre, je n'avais pas connu la caresse imprévue de sa glèbe sous mon pied; jusque-là, je l'avais visitée dans ce qu'elle possédait d'art, d'histoire, de musées, de splendeur et d'éblouissement, je ne lui avais pas senti palpiter l'âme; et je le vis bien, à la sensation nouvelle qui se mit à remuer ma poitrine, pendant qu'au dehors je pouvais suivre l'entrée en travail de la nature, le mouvement affairé des paysans qui nous saluaient de leurs râteaux, au passage, les petites gardeuses de vaches embuées dans la vapeur des chaumes; alors que au-dedans de mon fruste compartiment, j'entendais les propos de vendange des gens, l'inquiétude qu'inspirait la santé de la mère Brigitte et plus loin les reparties amusées d'un groupe de jeunes filles et garçons qui traçaient tout haut le programme de leur partie de plaisir à Cluny. C'est par eux que je découvris que le fameux monastère de Cluny ne se trouvait qu'à une légère distance et que, lié par mon itinéraire, je ne pourrais, à mon grand regret, faire la connaissance d'Héloïse et d'Abeillard.

Mais ce qui m'impressionnait par dessus tout, c'était cette suavité, cette harmonie d'églogue qui imprégnait l'atmosphère et les champs et semblait adoucir encore le bercement mélancolique que déterminait la fuite onduleuse des vallons et des collines. Et tout le temps je pensais: comment, avec sa soif d'harmonie au cœur et le souffle de ses vingt ans aux lèvres, Lamartine aurait-il pu résister au sein d'une telle nature, à prendre son luth?

Tout-à-coup il se fit un arrêt; j'entendis autour de moi: La Roche-Vineuse . . . la Roche-Vineuse.

—Déjà, murmurai-je.

. . . Je n'aperçus personne à l'arrivée, hors le chef de gare; ni un attelage, ni un chien, rien.

Seul un jeune homme, qui s'engagea aussitôt dans la grande route ouverte, était descendu du train en même temps que moi. Je l'interpelai:

—Dites-moi, Milly, est-ce dans cette direction?

—Je vais justement de ce côté, me repliqua-t-il. Vous n'avez qu'à m'accompagner, je vous indiquerai le chemin. . . . Non, monsieur, il n'y a jamais de voiture de place ici pour conduire les voyageurs. . . . Il n'en est guère besoin d'ailleurs. . . . Milly n'est qu'à une courte distance et la route qui y conduit est si belle. . .

En marchant il m'apprit qu'il habitait dans les environs et que mandé en hâte il s'empressait d'accourir auprès de son vieux père mourant.

Nous avions à peine franchi quelques cents pieds qu'une femme éplorée surgit à sa rencontre—sa sœur peut-être—et lui annonça que le pauvre vieillard avait succombé le matin même. D'un regard et d'un geste navrés il m'indiqua en sanglotant la direction que je devais suivre. Lui-même resta immobile, interdit, et je dus pour suivre seul.

En effet, quelle maladresse c'eût été pour moi de traverser ces ravissants paysages au trot, même lent, d'un attelage. J'aurais donc ignoré ce délice soudain que j'éprouvais pour la première fois à sentir enfin mon pied battre la plaine française, cette inlassable nourricière qui depuis la profondeur des siècles, sans jamais se plaindre des blessures souffertes, verse le vin et le froment à l'humanité.

Ce qui charmait, à ce moment, mes yeux et mon cœur ce n'était bien, il est vrai, que le spectacle, renouvelé de plus près, des scènes champêtres que je venais de savourer en chemin de fer—vignes accrochées aux flancs des collines, groupes de paysans au travail, chèvres broutant au bout des longes—mais ce que je découvrais tout à coup et qui jusque là m'avait paru absent du tableau, c'était cette dernière, incomparable et intraduisible retouche : la vendange. J'étais tombé en pleine vendange.

. . . Le chemin que je suivais alors montait en ondulations légères. Mais, en dépit des sinuosités, je me rendais compte qu'il m'entraînait insensiblement vers un petit clocher en pyramide—aussi humble que le plus humble clocheton de nos écoles à nous—qui, dans un fouillis de tilleuls et de platanes, émergeait des toits en tuiles rouges d'un hameau. Derrière, et lui servant d'épaule, une montagnette se dressait tranquille, sillonnée ici de discrets sentiers de chèvres, hérissée là d'arbustes sauvages et de rochers.

Et c'est alors que le vers fascinateur et inoublié du poète recommença de bruire doucement dans mon esprit : "Je suis né parmi les pasteurs."

Absorbé, les yeux à terre, bercé en quelque sorte par je ne sais quelle songerie, je continuai encore quelque temps à gravir la pente de plus en plus rocailleuse de la route, lorsque, relevant distraitemment mon regard au-dessus de la haie rustique que je longeais en ce moment, je l'aperçus . . . Oui, je l'aperçus : Lui . . . Alphonse Marie-Louis de Prat de Lamartine.

Il se tenait droit parmi les herbes arides poussées à travers les crevasses du roc, immobile au sommet d'une éminence que rien ne défendait. Isolé, délaissé, dédaignant, comme en sa vie d'homme, je suppose, de pencher son regard sur les laideurs d'en bas, il semblait fouiller les horizons lointains.

Je le reconnus parfaitement. Je n'eus besoin d'aucune autre indication. Je savais que c'était sa statue, sculptée par Lenoir et érigée en sa mémoire par la commune de Milly. J'en fis le tour pour en mieux lire la dédicace et les dates. Je chassai le troupeau qui paissait auprès; j'arrachai du sol certaines plantes qui envahissaient les pierres du socle et je repartis doucement. Cet abandon m'avait fait mal.

Tout le long du chemin, en montant, j'avais projeté faire une expérience. Rien que par la description que Lamartine avait lui-même donnée de sa maison natale, dans ses *Confidences*, je m'étais proposé de la découvrir parmi les autres maisons du hameau. Et comme je pénétrais maintenant dans le petit village lui-même, il me venait, malgré l'aspect vieilli et sans doute changé des choses, je ne sais quelle visions connues que subitement je retrouvais vivantes et dont je retraçais mentalement la source à telle page des *Harmonies*, à telle strophe ou tel vers de *Jocelyn*.

Tout-à-coup je reconnus la fontaine publique. Je me rappelai aussitôt l'abreuvoir autour duquel chèvres et bergers se bousculaient à l'heure du retour des montagnes. Puis ce fut l'église, au clocheton muet comme autrefois; quelques tilleuls dénudés auprès; des feuilles mortes blotties dans l'interstice des pavés. . . .

Je n'avais jusqu'ici demandé aucun renseignement quelconque. Sans effort je me guidais sur les descriptions lointaines retenues de mes lectures lamartiniennes. A qui me serais-je adressé d'ailleurs dans ce hameau mort, sans un bruit qui murmure, vidé pour la vengeance, je présume, de tout ce qu'il renfermait en apparence d'êtres vivants. Et pourquoi même en demander ?

Je continuai encore quelques pas. Je longuais cette fois un mur élevé, fait de planches mal repeintes que le temps et la pluie semblaient avoir été impuissants à ronger complètement et que balayaient doucement de l'intérieur de longues branches de platanes qui pendaient. Il en tombait sur le sable une ombre discrète, que le soleil s'amusa à zébrer de ses rayons.

J'allais passer outre, quand j'aperçus, en retrait, une haute et large porte faite de planches pareillement grossières. Alors simplement, naturellement, j'obliquai vers le mur, en suivant la courbe de l'ornière qui s'y dirigeait, et, comme dompté par une longue habitude, je fis pivoter le taquet qui retenait les battants au chambranle. Ceux-ci s'entrebaillèrent; quelques poules effarouchées s'envolèrent. Je m'avançai moi-même dans le silence. Je me trouvais, j'en étais sûr, en face de la maison natale de Lamartine.

—Tiens, on a fait disparaître les vieux pressoirs, pensai-je.

Je constatais peu de changements à part ça : même sol battu, même disposition des êtres ; les cinq gradins du perron étaient constitués des mêmes pierres écornées et massives ; “la grille toujours brisée” du jardin était au même endroit. C’est-à-dire que déjà je retrouvais l’empreinte rurale, intime et négligée, commune aux habitations campagnardes de France, et qui pourtant avait si puissamment impressionné l’enfance, la jeunesse et toute l’âme de Lamartine, en attendant qu’elle se déteigne si délicieusement sur chacune des pages de ses livres.

Mais je veux pénétrer plus loin, attiré par d’autres souvenirs et d’autres images que j’évoque : le jardin ; “l’allée de sa mère” ; les bancs de pierre sur lesquels il a écrit ses premières *Méditations* ; la charmille, où, repentant, le cœur dévoré de la flamme impure qu’il porte à Elvire et qu’il est impuissant à éteindre, il a “bu le pardon en larmes” de sa mère ; le lierre . . . oui, le lierre. . . .

Du bout de mon bâton, pour signaler ma présence, je frappai les pierres sonores du perron. J’eus peur un moment de le voir apparaître lui-même ; mais ce fut une femme qui vint répondre à mon appel et qu’à son costume de paysanne je jugeai la fermière autant que la gardienne des lieux. Habitée à ce genre de dérangement, elle s’enquit :

—Vous voulez visiter sans doute ? . . . Le propriétaire est absent toutefois, hésita-t-elle, une seconde . . . Qu’importe, je vous conduirai.

Le propriétaire . . . Comme ce mot sonna étrangement dans ma pensée, moi qui savais que c’était pour sauver Milly que Lamartine, acculé par les dettes, s’était décidé, en demandant pardon au monde, à vendre d’avance à la *Presse* le manuscrit de ses *Confidences*, “ces larcins faits à la pudeur intime de son foyer.”

—Le propriétaire est absent, dites-vous ? . . . mais le Maître, lui, ne l’est jamais ? . . . C’est lui seul que je désire voir.

Elle se contenta de sourire et me guidant :

—Que se passe-t-il donc à propos de Lamartine ? observa-t-elle aussitôt, en notant mon accent étranger, je suppose. Il nous vient des visiteurs de partout ; hier, d’Alger, l’autre jour, du Brésil, aujourd’hui. . . .

Provoqué par je ne sais plus quelle publication récente qui venait de faire grand bruit dans le monde littéraire, un réveil retentissant avait en effet lieu en ce moment au sujet de Lamartine et son nom avait repris de planer. Son souvenir était toujours demeuré, en France comme ailleurs, si à fleur d’âme, je dirais, qu’il avait suffi de ce simple livre, dont j’ai vainement cherché depuis à retrouver le

titre, pour le remettre en pleine lumière et susciter chez la foule le besoin de revoir les lieux qu'il avait habités.

Comme il faut qu'elle soit étrangement indélébile, n'est-ce pas, la mémoire que laisse l'écrivain de génie pour qu'elle s'attache jusqu'aux pures choses matérielles qui ont été les compagnes de sa vie. Rien que parce que ces choses rappellent sa trace, son passage ici-bas, elles héritent en quelque sorte naturellement de sa propre immortalité. Lui-même en retour leur lègue sa pensée, ses goûts, son image; si bien que mort l'homme de génie survit en elles et continue ainsi à habiter et à circuler presque physiquement, il semblerait, parmi les vivants.

Allez voir si Voltaire n'habite pas toujours Ferney; Rousseau, les Charmettes; Hugo, Guernesey; M^{de} de Stael, Coppet; Le Tasse, Torrente; et Chateaubriand et Byron et Shakespeare et jusqu'à ce pauvre Charles Dickens, dont on nous montre encore naïvement le verre et la place accoutumés dans la série de buvettes qui jalonnent la route de Londres à Dorchester.

. . . La cicérone poussa devant moi la grille du jardin. Je m'y insinuai en amortissant mes pas, comme dans un sanctuaire, car je me voyais déjà engagé dans l'allée discrète dont Lamartine s'écartait toujours avec respect, "en baissant la tête," tant il y retrouvait vivante l'image de sa mère recueillie et se promenant en tête-à-tête avec Dieu, à l'heure du crépuscule. C'est à l'extrémité de cette allée, sous un berceau de charmillles, que se trouve la table sur laquelle Lamartine écrivit ses premières poésies; table faite de pierres rugueuses et massives, appuyées sur des blocs de bois pareillement rugueux et massifs, mais que le souffle inspirateur des *Méditations* semble encore pénétrer, alléger et comme soulever.

Tout est très humble, très rural, presque grossier dans ce jardin, cette maison, ces murs, ces bois et pourtant nous n'en tenons nul compte. En effet c'était une sensation si étrange qui me poursuivait au sein de ce fruste décor, qu'une chose seule me préoccupait: retrouver la trace muette des pas de Lamartine dans les allées, le long du ruisseau à sec, dans les sentiers grimpants à travers la bruyère de la montagne, ou saisir l'écho de sa voix, soit qu'il récitât ses poèmes à ses sœurs, sous les charmillles, soit qu'il appelât ses chiens pour la chasse. Et je ne percevais rien des choses matérielles et sans poésie qui m'entouraient. Car personne plus que Lamartine en tous cas ne m'a si complètement subjugué l'esprit: autant par le sillage et la trace de sa vie d'homme sur terre, que par le sillage et la trace de sa pensée de poète dans ses livres.

—Et le lierre maintenant? demandai-je à ma cicérone qui tout le temps m'accompagnait docile, m'indiquait ici les ruines du vieux

moulin; là, le pan de rocher en voute où, au cours des vacances, Lamartine allait si souvent avec ses livres, ou en compagnie de son ami de Virieu, s'abriter contre le soleil; là-bas, le vallon qui servit de thème aux *Laboureurs*; plus loin, la hutte du tailleur de pierres, celui qui par pudeur sauvage, vous savez, ne voulut pas livrer le corps de sa fille à l'embaumeur et l'ensevelit lui-même, seul, la nuit. . .

—Et le lierre! repris-je. . . .

—C'est de ce côté; au pignon nord de la maison. Venez.

“Le lierre épaissit ses draperies déchirées contre les murs. Il empiète chaque année davantage sur les fenêtres toujours fermées de la chambre de ma mère.” C'est ainsi que le décrivait Lamartine lui-même en 1847.

Et cette simple date est bien révélatrice de son tempérament. Elle démontre l'insatiable besoin à son front de caresses et de souvenirs qui l'a poursuivi à travers toutes les phases de son existence, puisque, à cette époque, il se trouvait en pleine tourmente politique, au faite escarpé de ses triomphes publics . . . à la veille du vertige aussi.

Aujourd'hui, en 1912, malgré les branches sans cesse arrachées et emportées en souvenir par les multiples visiteurs qui se succèdent, le célèbre lierre a réussi à étendre davantage ses draperies. Elles se prolongent sur les fenêtres voisines et couvrent maintenant les murs jusqu'au toit.

—Vous en savez l'attendrissante origine? me demanda tout à coup ma cicérone, à voix voilée et comme avec une pudeur de trahir l'intimité du foyer de Lamartine.

—Oui, je la sais, répondis-je pareillement bas. On la trouve dans “le manuscrit de sa mère.” n'est-ce pas?

Quand Lamartine écrivit ses premières poésies, celles surtout qu'il consacra à décrire son pays d'enfance, ce fut par pure fiction de poète qu'il y mentionnait l'existence d'un lierre auprès de sa maison natale. Il n'existait pas de lierre. Et c'est alors que sa mère, qui suivait avec fierté ses succès littéraires, eut cette idée touchante qu'elle nous dévoile dans son manuscrit: “J'ai semé moi-même en secret ces tilleuls et ce lierre afin que mon fils ne mentit pas dans ses *Harmonies*.”

Est-il en littérature quelque chose de plus tendre, de plus profondément *mère*! Non, rien. Si ce n'est peut-être l'apostrophe—horrible à force d'immolation sauvage—que la *Glu* de Richépin jette à son fils. Celui-ci féroce, vient de lui arracher le cœur et il s'enfuit avec en courant, mais dans sa précipitation il se heurte et tombe avec violence. Alors la mère qui l'a vu s'abattre: “T'es pas fait mal mon enfant?”

. . . Pour m'en rappeler davantage l'aspect et comme pour mieux vous en parler, de ce lierre, je suis allé chercher (entre les pages du volume de *Jocelyn* où je les avais enfouies à mon retour) les frêles tiges que j'avais moi-même détachées, lors de mon passage à Milly. Je les ai en ce moment sous les yeux. Elles ont perdu leur verdure sombre: elles sont desséchées, jaunies, à peine différentes des pauvres branches mortes de mon pays. Malgré moi cependant je m'imagine qu'un souffle invisible les pénètre, les parfume et les anime encore.

C'est pourquoi je me souviens qu'en examinant les vieux murs que le lierre encérclait et assourdissait, je cherchais à reconstituer dans mon esprit les prières et les défis, les chants d'amour ou les soupirs de douleur, les accents de triomphe où les gémissements désespérés, c'est-à-dire tous ces spasmes d'âme si opposés qui tour à tour ont si dramatiquement ballotté l'existence de Lamartine: sa vie d'exultante jeunesse comme sa vie de vieillesse isolée, sa vie parlementaire et politique autant que sa vie d'historien et de poète.

Et ce sont les échos de ces accents—ode à Napoléon, couplets à Elvire, apostrophes au drapeau rouge, stances au crucifix—que, trois quarts de siècle après, je redemandais au sein refroidi de son foyer natal et que je m'efforçais d'arracher, comme à travers des doigts crispés, à l'étreinte discrète et fidèle du lierre.

* * *

Mon pèlerinage n'aurait pas été complet cependant, si je n'eus pas cédé à une autre voix qui tout le temps bruissait à mon oreille: celle du curé de Bussières, l'abbé Dumont, le mystérieux confident des premières aspirations poétiques de Lamartine, en attendant d'être le modèle du vieux prêtre incarné dans *Jocelyn*.

—C'est de ce côté, Bussières, madame?

—Justement, monsieur.

—Et voilà, je suppose, le sentier creux que suivait Lamartine dans sa visite quotidienne à l'abbé Dumont? . . . La pierre tombale qu'il a érigée à sa mémoire existe-t-elle encore?

—Mais oui; exactement à l'endroit qu'il désigne dans ses livres, près de l'église. . . . Vous aimeriez la voir? . . . Pourquoi n'y passez-vous pas? . . . Ce n'est qu'à une courte distance, ajouta-t-elle avec sympathie.

Jugeant en effet que j'avais encore amplement de temps à ma disposition, je remerciai avec effusion l'excellente dame; quant au traditionnel pourboire ce fut avec une gêne véritable que je me risquai à le lui tendre à mon départ. J'avais peur de la blesser, tant je venais de la voir s'acquitter de son rôle d'une manière si différente des autres. Et alerte, sentant avec une précision plus nette que

jamais la trace presque vivante des pas de Lamartine sous les miens, je m'éloignai, croyant qu'il me guidait lui-même à travers les méandres du sentier.

Je traversai de nouveaux vignobles. Tout le monde—hommes, femmes, filles, enfants—était perdu dans les pampres, absorbé par les travaux de la vendange. La plupart, aimablement, me tendirent au passage d'appétissantes grappes de raisin. Plus loin je croisai un jeune paysan qui, sa pioche à l'épaule, dévalait des collines en sifflant. Je me proposais de lui demander si j'allais bientôt atteindre Bussières, quand j'aperçus l'église, surplombant à peine les quelques maisons voisines enfouies sous les arbres.

Et c'est ici que je conserve, à côté de tant d'autres, l'une des sensations les plus exquisées de mon pèlerinage au pays de Lamartine.

En cours de route, on déraille vite en dehors du calendrier. Les jours, les dates se succèdent confusément. D'autant plus qu'en Europe, nous, Canadiens de Québec, nous manquons de cet effectif point de repère: le dimanche, dont la physionomie toute spéciale tranche si absolument ici sur celle des autres jours. Mais là-bas, c'est le même mouvement affairé dans les villes et les champs; les journaux s'impriment; les théâtres flamboient; on y bat son blé, on y arrache ses choux; le vin pétille à toute heure dans les cafés; le paysan porte la blouse et les sabots qu'il portait la veille. Rien ne diffère en somme.

Aussi quelle sensation ineffable et suave j'éprouvai tout-à-coup d'entendre par la porte ouverte de l'église la crépitation connue de lèvres qui prient. C'était dimanche. Exactement comme je l'avais souhaité, un merveilleux hasard me jetait au milieu d'une grand-messe, en pleine terre paysanne. Doucement, j'entrai.

Mais cette fois, la sensation, c'est eux qui l'eurent—la dizaine de vieilles femmes; les deux joviaux vigneron, toujours paresseusement assis au fond, comme pour se reposer à l'ombre en passant, et les quelques enfants de chœur,—en voyant cet étranger en bottes vernies s'insinuer dans les banquettes. Jusqu'à l'officiant, un sympathique vieillard à cheveux blancs, qui ne manqua pas une occasion de me reluquer entre ses bras levés pour les oremus.

Indifférent à leurs mines curieuses cependant, je donnais cours à mes propres impressions. Et bientôt je me sentis de mon côté imperceptiblement remué par l'aspect vieilli quoique très propre des choses: le dénuement de l'autel, le vide décrépi des murs avec leurs grêles images de chemin de croix collées dessus, les trois doigts d'allée qui séparait les bancs au centre, l'exiguïté de l'église elle-même qui serait à peine chez nous une chapelle pour colons; tout cela, bien que présentant un cachet de dignité simple, criait à mes oreilles de

Canadien, le degré de marchandage avare et d'insouciance glacée auquel la vieille foi catholique était descendue en ces régions.

J'éprouvai dans un ordre différent une autre déception. J'avais tout examiné. Il ne me tardait plus que de connaître à quelles enjoleuses précautions oratoires le brave curé pouvait bien recourir pour sermonner profitablement d'aussi sourdes ouailles; quelles annonces aussi il allait bien leur communiquer et de quel verbe. Se mariait-on, là, aussi? Mourait-on? Quelqu'un s'avisait-il de faire prier pour les âmes des défunts? J'avais hâte de comparer les formules aux nôtres et d'en noter les variantes, mais je fus déçu. Un bref et sec *Ite missa est* clotura brusquement l'office et chacun pivota en hâte vers la porte. Et cela remit en équilibre bien des choses dans ma pensée, car je compris que l'officiant n'était pas la dupe de son troupeau et qu'il ne lui en donnait en somme que pour son argent.

Bien d'autres curés, n'est-ce pas, ont ainsi prié avant lui dans la petite église de Bussières; bien d'autres comme lui ont tendu les bras du haut du même autel, mais l'on ne s'en souvient plus; l'on ne sait rien d'eux. On n'imagine plus que leurs ombres dans la fuite reculée des siècles. Et n'ayant eux-mêmes rien laissé d'eux, ni un livre qui les révèle, ni un geste, ni une trace qui les prolonge, ils se jugent sans doute bien éteints sous les cinq pieds de terre de leur obscur cimetière de Bussières.

L'abbé Dumont pense probablement de même du fond de son immuable repos. Il se considère bien entièrement et éternellement sorti de toutes les mémoires. Jamais il ne saurait en effet se représenter que, soixante et quinze ans après sa mort, à des milliers de lieues, à l'autre bout du nouveau-monde, quelqu'un pût encore s'intéresser à lui et se rappeler son nom et son histoire. Et c'est pourtant ainsi. Il aura suffi de l'amitié de ce jeune homme dont il avait un jour, sans le savoir, regardé avec sympathie éclore les rêves, pour qu'il échappe à l'oubli et rayonne au contraire en pleine immortalité.

Lamartine en parle ainsi dans ses *Confidences*: "Notre amitié s'était cimentée avec les années; elle a duré jusqu'à sa mort; et maintenant, quand je passe par le village de Bussières, mon cheval, habitué à ce détour, quitte le grand chemin vers une petite croix, monte un sentier rocailleux qui passe derrière l'église, sous les fenêtres de l'ancien presbytère et s'arrête un moment de lui-même auprès du mur d'appui du cimetière. On voit par-dessus ce mur la pierre funéraire que j'ai posée sur le corps de mon ami. J'y ai fait écrire en lettres creuses pour toute épitaphe son nom à côté du mien. J'y donne, un moment en silence, tout ce que les vivants peuvent donner aux morts: une pensée . . . une prière . . . une espérance de se retrouver ailleurs." . . .

Ce sont ces deux noms, l'un éclairant l'autre, et moins indissolublement liés dans le marbre que dans les pages de *Jocelyn*, que je venais chercher parmi les pierres tombales du petit cimetière de Bussières. Je n'eus pas, moi, à regarder par-dessus le mur; ce mur n'existe plus. Le temps, qui paraît avoir hésité devant tout le reste, l'a rasé jusqu'au sol. Il m'a suffi de contourner le flanc de l'église et de faire trois pas à travers les herbes: la dalle funéraire de marbre jauni m'est apparue, couchée à plat sur le sol, "posée sur le corps de mon ami," selon qu'il le dit.

Elle porte en profondes et larges lettres noires: "Alphonse de Lamartine à son ami l'abbé Dumont." Pas un mot de plus, pas une date, rien qui renseigne l'étranger ou l'indifférent. C'est comme entre-eux deux, et pour eux deux seuls, la continuation, par delà la vie et à l'abri des oreilles, de leurs confidences passées; ce sont en apparence les mêmes propos simplement épanchés d'un peu plus près et à voix plus basse. . . . Et c'est suprêmement touchant.

Longtemps je suis demeuré adossé au mur de l'église, dans la chaleur entassée du soleil et dans le mystère. En vain j'ai demandé aux passants si quelque vieillard restait qui retint encore dans sa mémoire le souvenir de celui-là qui avait été son curé et qui n'était plus qu'une ombre. Comme pour le mur du cimetière, je découvris que le temps les avait tous tour à tour rasés.

. . . Tout-à-coup, avec ma branche de lierre bien blottie sur ma poitrine et roulant en ma tête mes pensées, comme je roulais sous mon pied les cailloux de la route, je m'aperçus que je rentrais à la Roche-Vineuse.



Les métamorphoses dans les contes populaires canadiens.

PAR C.-MARIUS BARBEAU, M.S.R.C.

(Lu à la réunion de mai, 1916).

L'ancienne croyance aux métamorphoses est universellement répandue chez tous les peuples de la terre. Ses multiples variations relèvent d'un petit nombre de mythes distincts, dont l'origine remonte peut-être à des sources diverses et indépendantes. Bien qu'éminemment dignes de l'attention des mythographes et des folkloristes, les problèmes complexes ayant trait à l'antiquité plus ou moins grande de ces mythes, à leur centre de diffusion et à leur périphérie de rayonnement respectifs n'ont pas encore été scrutés à fond.

Le cadre de notre travail n'embrasse d'ailleurs qu'un point de cette vaste étude; et il nous suffira ici d'examiner quelques variétés de métamorphoses qui se sont conservées jusqu'à nos jours dans les traditions des paysans d'origine française, au Canada.

Les deux sources canadiennes principales, quant à ces données, sont le folklore et les contes populaires. Tandis que le premier, ne l'oublions pas, consiste en des croyances amorphes et vivantes répandues parmi le peuple, les seconds se présentent sous forme de textes rigides et traditionnels, récités à titre d'amusement et sans qu'on y ajoute le plus souvent foi.

Si le folklore a déjà inspiré aux littérateurs canadiens maintes pages curieuses sur la sorcellerie, les loups-garous et la *chasse-galerie*, il est bon de se rappeler que la plupart des légendes et des rumeurs populaires concernant les métamorphoses sont restées inédites. Les quelques récits de cette nature qu'ont rapportés Philippe-Aubert de Gaspé, J.-C. Taché, Louis Fréchette, Benjamin Sulte, H. Beau-grand et Louvigny de Montigny ne constituent qu'un bien faible écho des croyances vivaces qui, dernièrement encore, se perpétuaient chez nos paysans et faisaient surgir dans leur imagination fertile des anecdotes sans nombre et toujours renouvelés.

La rareté relative et la valeur scientifique incertaine de ces données littéraires, toutefois, nous empêchent d'entreprendre ici l'examen de la phase intéressante des métamorphoses qui relève du folklore. Nous préférons procéder à l'étude de celle qu'a récemment mis en lumière un nombre considérable de contes populaires canadiens, recueillis parmi les paysans de la Province de Québec.

Pour exprimer les phénomènes mythologiques qui nous intéressent, les conteurs rustiques canadiens ont un vocabulaire qu'il est bon de connaître. Si on entend souvent parmi eux les mots '*amorphoser*' ou '*amorphosé* sous la forme de . . .' (pour '*métamorphoser*' ou '*métamorphosé en*'), maints autres termes sont aussi en usage. Pour dire qu'une personne ou une chose est métamorphosée en une autre, ils emploient les expressions suivantes: '*se changer en* (canard),' '*être changé en* (aigle),' '*se tourner en* (chenille),' '*se mettre en* (lion),' '*(château) viré en* (or).' Le mot '*devenir*' se rencontre ailleurs; ainsi on dit: '*(le prince) devient* (sec et immobile),' '*soudain il devint* (un grand officier blond),' '*(un crapaud) devient* (le plus beau des chevaux).' On se sert encore de locutions comprenant la préposition '*en*' pour exprimer l'état d'un être métamorphosé, comme dans les cas que voici: '*Un prince amorphosé qui, le jour, est en bête féroce et, la nuit, en beau prince,*' '*Il faudrait qu'on me tue quand je suis en lion,*' '*Le voilà en poulain,*' '*Il arrive en personne*' (pour '*transformé en personne*'), '*Je passerai en nuée bleue,*' '*Elle arrive en souris,*' et '*Il part en petite lumière qui s'en va au ciel.*' Une transformation est tout simplement impliquée dans les exemples suivants: '*Tu n'auras qu'à penser à moi et tu seras la plus belle de toutes les chenilles,*' '*Il jette l'étrille et voilà une montagne d'étrilles,*' '*Elle se fourre dans la cuve, et il en sort une belle princesse.*' Les expressions '*le Corps-sans-âme paraît sous la forme d'un lion*' et '*Un château morfondu*¹ en marécage' sont exceptionnelles.

La levée du charme qui cause la métamorphose ou la rupture de l'enchantement s'expriment indifféremment par les mots '*démorphoser*' (pour '*dé-métamorphoser*'), '*délivrer*,' '*revenir*' et '*redevenir*.' Ainsi on entendra des phrases comme celles-ci: "*Quand le prince amorphosé revient à lui, il dit: 'C'est toi qui m'a délivré,' "*" "*Que faudrait-il faire pour le démorphoser?"*" et "*Pour le délivrer de cette peau de bête, il faudrait qu'on la brûlât tout entière.*"

Dans les légendes et les contes traditionnels du Canada, non seulement les choses inanimées, mais aussi les êtres humains et les animaux sont sujets à des métamorphoses variées.

Peu nombreuses, les transformations de choses inanimées semblent le plus souvent s'opérer par le concours d'agents personnels.

Dans le conte de '*La Belle-jarrettière-verte*' un magicien du nom de Bon-évêque opère des merveilles que deux extraits du texte suffiront à expliquer ici:

¹ Pour '*changé en marécage.*' Ce mot est peut-être une corruption de '*fondre, fondu;*' car on dit ailleurs, dans le même conte, '*c'était un château de glace.*'

. . . Les voilà qui se mettent à jouer aux dés. C'est Beau-prince qui gagne. Bon-évêque dit: "Que me demandez-vous, Beau-prince?"—"Je vous demande que le château de mon père soit tout changé en or et en argent, et soit soulevé sur quatre chaînes d'or." Bon-évêque répond: "Allez-vous en! tel que vous demandez ça sera fait." Beau-prince part, et tel qu'il l'a demandé c'est fait. S'en allant trouver son père et sa mère, il dit: "Vous ne pensiez pas que jouer aux dés était un beau métier. Eh bien! voilà votre château *viré en or et en or et argent*. Pas un roi n'en a de si beau." . . .¹

Le lendemain matin, ils jouent encore aux dés. Voilà Beau-prince qui gagne encore. "Qu'est-ce que vous me demandez, Beau-prince?"—"Je vous demande que les bâtiments de mon père soient soulevés sur quatre chaînes d'or, et que les écuries et les animaux y soient tous changés en or et en argent."—"Tel que vous demandez ça sera fait." Revenu chez son père, Beau-prince voit que tout ce qu'il a demandé est accompli. . . .

Un épisode du même genre se trouve au conte de 'Salade et pommes d'or,' où, grâce à un don que lui confère un talisman, Petit-Jean soulève un pont et le suspend au firmament par quatre chaînes d'or; et tout cela pour épouser la fille d'un roi qui a été promise à celui qui accomplirait cette merveille.

Au conte de 'Prince *en nuit* et bête féroce *en jour*,' des petits bouts de corde qu'on file sur un rouet et une quenouille enchantés se transforment en belle soie, qui se change en des robes merveilleuses aussitôt qu'on y touche avec des ciseaux magiques.

Une ville et des châteaux soi-disant métamorphosés, dans les contes de 'La sirène,' de 'La fée galeuse de la mer Rouge' et du Chat au pays des rats, sont temporairement ensevelis au fond de la mer; et seules des opérations précises et mystérieuses peuvent les 'délivrer.'

Au conte de 'Petit-Jean et la chatte blanche,' le fils d'un roi rapporte à son père une petite noix laide et sale, mais enchantée, de laquelle sortent trente aunes de belle toile du pays, aussitôt qu'on la brise.

D'autres transformations, comme celles des 'obstacles magiques,' semblent s'opérer spontanément. Ainsi une écaille, une étrille, une bride, une brosse, un rasoir ou une bouteille se transforment ou paraissent tour à tour se changer en montagnes infranchissables d'écailles, d'étrilles, de brides, de brosses, de rasoirs ou de bouteilles, qui entravent la course de sorciers malfaisants. Citons-en deux exemples. Le premier vient du conte de 'Ti-Jean et le cheval blanc.'

. . . Avant le retour de la magicienne, le cheval blanc dit à Ti-Jean: "Mon petit garçon, c'est le temps de désertier. Tu te ferais tuer pour t'être mis la tête dans sa fontaine d'or."

¹ Récité par Achille Fournier, à Sainte-Anne (Kamouraska), en juillet, 1915.

Et ils se préparent à partir. "Prends l'étrille et une bouteille, dit le cheval blanc; bride-moi et partons! Quand elle arrivera, ça ne sera pas drôle." Ti-Jean prend donc l'étrille et une bouteille, et les met dans sa poche; bride son cheval blanc; et ils partent. . . .

. . . Pendant que Ti-Jean et le cheval blanc se sauvent à l'épouvante, ils voient venir, en arrière, une tempête terrible. Le cheval dit: "C'est la vieille magicienne qui court après nous. Si elle nous rattrape, c'est la mort." La tempête approche. Quand elle est tout près, le cheval dit: "Jette ton étrille!" Jette l'étrille; et voilà une montagne d'étrilles, dans laquelle la vieille et son cheval s'empêtrent. Ti-Jean et son cheval se sauvent à toute vitesse. . . .¹

Dans le deuxième cas, qu'on retrouve au conte de 'La Belle-jarrettière-verte,' une illusion visuelle due à un enchantement explique ces embarras presque infranchissables jetés au travers de la route du sorcier. Citons un extrait du texte:

. . . Avec ses bottes de sept lieues, Bon-évêque poursuit Beau-prince. La Belle-jarrettière-verte dit: "Papa s'en vient pour nous saisir. Tu me le diras quand il sera tout près." Une minute après, il dit: "Tiens! voilà ton père qui arrive." Elle prend une brosse et la jette derrière elle. À Bon-évêque cette brosse paraît comme une grosse montagne de pains. "Mais! dit-il, qui aurait tout ce beau pain-là, chez nous, serait bien content!" Il s'en retourne donc chez lui, le dire à sa vieille. Elle répond: "*Bougre de fou!* c'est une brosse qu'il a jetée derrière lui. C'est moi qui vas y aller." Mettant ses bottes de sept lieues, elle *adenne* après.

Parlons maintenant des métamorphoses proprement dites ou changements de nature de personnages réels ou mythologiques.

Ces transformations se groupent en deux catégories. Dans la première, la métamorphose entière ou partielle du sujet est spontanée. Des maléfices ou ensorcellements, dans la seconde, opèrent l'enchantement de victimes passives, qui ne peuvent recouvrer leur forme humaine qu'avec l'accomplissement d'une condition déterminée.

Quand la métamorphose d'une personne en un animal ou en un objet s'opère spontanément, c'est-à-dire par un acte libre de sa volonté, ce phénomène peut commencer, finir ou se renouveler à souhait. Cette faculté s'aide d'ailleurs de quelque don surnaturel, d'un art mystérieux ou de talismans, que les paysans canadiens nomment quelquefois des *souhaite-vertus*.

La fille du sorcier Bon-évêque, dans le conte de 'La Belle-jarrettière-verte,' se transforme en souris pour échapper à la vigilance de son père. Voici le texte de ce passage:

. . . La Belle-jarrettière-verte dit à Beau-prince: "Aujourd'hui, je n'irai pas en *criétude*, mais en souris. Je t'enseigne-

¹ Récité par Paul Patry, Saint-Victor (Beauce), en août, 1914.

rai; et ton ouvrage se fera *pareil*." En arrivant au bord du lac, Beau-prince, pour construire son pont, commence à jeter des cailloux dans l'eau, jette des cailloux. Mais il ne peut rien faire de bien. Voyant ça, il se couche, en disant: "Je penserai à ma Belle-jarretière-verte, et mon pont sera fait." Il s'endort et commence à ronfler. Vers le soir, il se réveille et dit: "Ma Belle-jarretière-verte, à moi!" Elle arrive en souris, disant: "Si tu avais pensé à moi plus vite, ton pont serait fini." Dans un tour de main, voilà le pont fait, *que* la poussière en *revole* à sept lieues à la ronde. . . .

Dans le même conte, on trouve le trait mythologique des 'Vierges cynes':

. . . Une vieille magicienne dit à Beau-prince: "Il va bientôt venir ici trois filles. Une d'elle s'appelle la Belle-jarretière-verte. En arrivant ici, sur la grève, elles mettront leur *butin* sur une roche, et se changeront en canards [pour nager dans la mer]. Tu prendras la belle jarretière verte, tu la mettras dans ta poche, et tu te cacheras un peu plus loin. . . ." Quand la Belle-jarretière-verte revient chercher sa jarretière, elle ne trouve pas de jarretière. Elle dit à ses sœurs: "Il est venu un jeune homme ici, *betô*. C'est peut-être lui qui l'a prise. Je vas aller le trouver." S'approchant du jeune homme, elle dit: "Est-ce toi, Beau-prince, qui a pris ma belle jarretière verte?"—"Non, ce n'est pas moi."—"C'est toi qui l'as *pris*."—"Ben! ma Belle-jarretière-verte, je ne te la donnerai pas tant que tu ne *m'auras pas passé cette rivière*."—"Es-tu fou? Je vas *te passer la rivière* sur mon dos, *ast'heure!*"—"Belle princesse! faites-en votre résolution." Elle se change donc en canard et lui passe la rivière sur son dos. . . .

Plus loin, dans le même conte, vient le passage suivant:

. . . Voyant sa mère courir après eux, la *câline drête* à pic sur la tête, la Belle-jarretière-verte fait paraître *comme* un lac devant elle, et elle se change *avec* Beau-prince en canards, *tous les deux*. Ayant un petit sac d'avoine, la vieille appelle les canards: "Mes petits, mes petits! Venez donc manger de l'avoine." Le canard Beau-prince cherche tout le temps à y aller, mais la Belle-jarretière-verte le *picoche* toujours sur le bec, pour le faire revirer. . . .

Au conte de 'Les deux magiciens' se trouve une série de métamorphoses spontanées. Citons-en des extraits:¹

. . . Longtemps après, le jeune homme s'en retourne chez son père et dit: "*Ast'heure*, je suis instruit *sur* le bien et *sur* le mal." Son père répond: "Oui! Que sais-tu, mon garçon?"—"Demain, je vas me changer en beau cheval blond, et vous irez me vendre, à la ville, pour cent et une pistoles. Mais, vous vous réserverez la bride et la selle." Le père s'en va à la ville et vend le beau cheval blond, comme il est entendu. Aussitôt vendu, débridé et dessellé, voilà le cheval blond qui échappe, prend la course et disparaît. L'acheteur court après; et bientôt, il

¹ Recueilli à Sainte-Anne (Kamouraska), en juillet, 1915, de Achille Fournier.

aperçoit un beau prince -- son cheval blond s'était changé en prince. "Mais, monsieur le prince, n'avez-vous pas vu passer un beau cheval blond, par ici?" -- "Oui, et le tonnerre l'emportait."

(Quand, le lendemain, le père retourne vendre le cheval, au marché, un magicien l'achète et le ramène chez lui) . . .

Quand le magicien est parti, les servantes s'en vont à l'écurie et voient le cheval se frotter sur la *barrure* pour montrer qu'il a faim et soif. Elles disent: "Ce pauvre cheval a faim et soif. Sortons-le de l'étable et allons le faire boire." Elles l'emmènent à la rivière pour le faire boire. Mais avec la bride et la selle, il ne veut pas boire, et il se frotte pour tâcher de les ôter. Les servantes disent: "Pauvre cheval! ôtons sa bride et sa selle, pour qu'il puisse boire." Aussitôt dessellé et débridé, il leur échappe et *se file en quatre* dans la rivière, [où il devient une carpe] . . .

Pour ne pas être attrapée par les cinq cents pêcheurs du magicien, la carpe se change d'abord en beau diamant jaune, ensuite en un pépin, dans une pomme. On jette la pomme au mur, et comme les pépins s'éparpillent sur le plancher, le magicien se change en coq pour les manger. Un pépin se transforme en renard . . . "Et *crac!* voilà le renard qui dévore le coq. Le magicien est détruit . . ."

Un petit nain, au conte de 'Le sabre magique,'¹ grandit soudainement et devient un géant terrible. Voyons le texte:

. . . Le roi dit à Petit-Jean: "Tu te prétends capable de garder mes vaches, dans la forêt, toi?" -- "Oui, sire le roi, la peur ne me connaît point." Il part donc avec le troupeau du roi et s'en va vers la forêt. Les bœufs sont si maigres qu'ils ont de la misère à marcher; les vaches *tricollent* dans le chemin. Mais Petit-Jean les mène au bout du bâton, en criant: "Hatôhol, hatôhol!" Rendu dans la forêt, il s'assoit sur une souche, en gardant ses animaux. Fatigué d'être assis, il part, à la fin, et s'en va vers la montagne. En chemin, il aperçoit un petit bonhomme, près d'un ruisseau, qui se met les pieds dans l'eau. Il se met à grandir, grandit, et, bientôt il devient si grand qu'il dépasse de sa tête la montagne. C'est lui, cet être-là, qui détruisait les troupeaux et les armées du roi. Petit-Jean, qui n'a peur de rien, prend son sabre [magique], et, se tenant sur le haut de la montagne, d'un coup de sabre, décolle la tête du géant de *sur* ses épaules. Redescendant la montagne, il aperçoit un beau château. Il y entre, et il rencontre trois princesses. "Mais, princesses! par quelle aventure êtes-vous ici?" -- "Bien! répondent-elles, nous sommes 'gardées' ici par trois géants." -- "Ah, dit Petit-Jean, . . . je vous ai 'délivrées', moi qui ai détruit le petit bonhomme qui grandissait en se mettant les pieds dans un ruisseau" . . .

Il arrive souvent au diable, suivant nos conteurs, de se changer à souhait en différent animaux, soit pour capter des âmes humaines,

¹ Recueilli à Sainte-Anne (Kamouraska), en juillet, 1916, de Achille Fournier.

soit pour s'emparer de ses victimes, à l'échéance d'un terme fixé. Ainsi, on dit que pendant un certain temps, sous la forme d'un chat, il escortait un bûcheron qui lui avait vendu son âme. Dans la légende de 'Frédérico va au ciel,'¹ il se présente au gai viveur Frédérico, sous les apparences d'une souris parlante.

. . . (Extrait) Au bout d'un an, le diable arrive encore chez Frédérico; mais, cette fois, il est venu en souris. Frédérico, qui est à souper, dit: "Ma petite souris, fourre-toi donc dans mon sac, et grignotte en m'attendant." Une fois la souris dans le sac [magique], Frédérico s'en va le porter chez le forgeron. Là, il fait frapper deux forgerons sur le sac avec des gros marteaux de fer. "Aye, Frédérico, lâche-moi, lâche-moi!"—"Ah! je ne te lâcherai que si tu me promets de ne jamais avoir droit sur moi, et que si tu me donnes douze damnés de ton enfer" . . .

Bien que désirées ou, du moins, prévues par les sujets sur lesquels elles s'exercent, certaines métamorphoses ne se produisent qu'au moyen d'un talisman dont la vertu est ordinairement restreinte à un effet spécial et déterminé. De ces objets merveilleux résulte une transformation soit totale, soit partielle, ou encore, simplement un état nouveau. Citons des extraits, comme exemples. Le premier est tiré du conte de 'Salade et pommes d'or.'

. . . Sur le dos de l'aigle, Ti-Jean commence à descendre. A trente pieds de terre, voilà que l'aigle l'échappe. Ti-Jean tombe à quatre pattes dans un jardin, sur un carré de salade. "Bien! il se dit, je vas toujours manger une feuille de salade." Il en mange une feuille. Le voilà en poulain. "C'que c'est qu'ça? Me voilà en poulain, *ast'heure!*" Et il se met à trotter autour du jardin. Arrivé à un beau pommier, il mange une pomme. Il devient un beau prince. En pensant: "Voilà bien mon affaire!" il met une couple de pommes dans sa poche, et apporte une brassée de salade, qu'il laisse au bord d'un ruisseau, devant le château de la magicienne. Le voyant entrer, la vieille lui demande . . . "Qu'apportais-tu dans tes bras avant d'entrer?"—"J'apportais la meilleure salade qui se trouve dans le royaume, et je l'ai laissée près du ruisseau." A une servante la magicienne dit: "Va chercher la salade, mais, prends bien garde d'en manger." La servante lave la salade dans le ruisseau, en mange une feuille, et la voilà changée en pouliche. Au lieu de s'en retourner au château, elle prend le chemin de l'étable et se met dans une *barrure* du fond. . . . Ne voyant pas revenir la servante, la vieille magicienne envoie la princesse, sa prisonnière, chercher la salade. Pendant qu'elle lave la salade, la princesse pense: "Quand même j'en mangerais une feuille, ça ne ferait rien." Mange une feuille, et la voilà en belle pouliche brune, qui prend le chemin de l'étable. . . . (La vieille magicienne y va elle-même, à la fin). Au bord du ruisseau, en lavant la salade, elle pense: "Elle m'a l'air *ben* bonne." Elle

¹ Recueilli à Sainte-Anne (Kamouraska), en 1915; conteur, Achille Fournier.

mange une feuille, et la voilà une vieille jument, la peau collée aux côtes, et *tricollant* dans le chemin. . . .¹

En reconnaissance d'un faveur, des animaux fabuleux font présent à leurs bienfaiteurs de certains charmes que vont décrire ici des extraits pris dans le conte de 'La sirène.' Un épisode tout à fait semblable se rencontre aussi dans celui du Corps-sans-âme:

. . . L'aigle dit à Georges: "Monsieur, servez-vous de nous [quand vous désirerez une faveur]. Quand à moi, je vous donne cette plume. Vous n'aurez qu'à dire 'Adieux, aigle!' et vous deviendrez aigle, le plus beau de tous les aigles, volant les trois quarts plus vite que tous les autres." Le lion ajoute: "Prends le poil blanc qui se trouve sous ma patte gauche d'en arrière. Si tu veux te *mettre en lion*, tu n'auras qu'à penser à moi, et tu seras le plus fort de tous les lions." La chenille dit: "Moi, je ne suis pas grosse, mais ça ne fait rien. Arrache ma patte gauche d'en arrière, et quand tu voudras devenir chenille, tu n'auras qu'à penser à la vertu 'de ma chenille,' et tu seras la plus belle de toute les chenilles." Les remerciant bien, Georges continue son chemin. Arrivé au bord d'un fleuve, il s'assied sur la grève. Qu'est-ce qu'il voit venir, au loin? Un pigeon si fatigué de voler qu'il est prêt à tomber à l'eau. Comme il pense à son aigle, le jeune homme devient aigle, prend sa volée vers le pigeon, et le rapporte à terre, sous son aile. . . .²

Avec l'aide d'une baguette magique, le héros d'un conte de 'La Bête-à-sept-têtes'³ se change en beau courtisan:

. . . Le matin des noces, Ti-Jean se toucha avec sa baguette, en disant: "Je veux devenir un grand officier." Soudain, il devint un grand officier blond, avec un uniforme chamarré d'or. Il avait un grand chapeau de velours, galonné d'argent, avec une belle plume blanche. A son côté, il portait une épée d'or. En le voyant descendre ainsi, dans la cour du château, la princesse se prit à l'aimer davantage. . . .

À la manière de l'eau de Jouvence qui ramenait la jeunesse, certains liquides merveilleux, à en croire le folklore, pouvaient transformer ou guérir soudainement ceux qui avaient la bonne fortune d'en obtenir. Ainsi, aux contes de 'Paroles de fleurs, d'or et d'argent' et de 'Prince-Joseph,' on parle d'eau 'de la *rajeunie*' (eau qui rajeunit). Une fée, dans l'un, est la gardienne de la source d'où jaillit cette eau. Dans l'autre, des géants en sont les possesseurs jaloux. Citons encore:

. . . Ne voulant pas s'arrêter à la ville de cristal, Prince-Joseph⁴ continue son chemin, [toujours à la recherche de l'eau

¹ Recueilli à Sainte-Anne (Kamouraska), de Achille Fournier.

² Recueilli de N. Thiboutot, à Sainte-Anne (Kamouraska).

³ Recueilli par M. Gustave Lanctôt, à Saint-Constant (LaPrairie).

⁴ Raconté par Achille Fournier, à Sainte-Anne (Kamouraska).

de *la rajeunie*]. Le long de sa route, il rencontre une vieille magicienne, qui lui dit: "Pour y arriver, vous avez un pont tout en rasoirs à traverser. A midi juste, vous *embarquerez* sur le dos du vieil ours blanc, le seul qui traverse ce pont." A midi juste, Prince-Joseph traverse le pont de rasoirs à cheval sur l'ours blanc, entre au château des géants, où il prend de l'eau de *la rajeunie* à la fontaine. Il ouvre une porte et aperçoit une belle princesse endormie. Regardant l'heure, il voit qu'il n'y a plus que cinq minutes avant que les géants se *réveillent*. Se dépêchant, il prend la princesse, la met à cheval sur son ours blanc, et traverse le pont de rasoirs. Les géants se réveillent et, s'apercevant de ce qui vient d'arriver, ils crient: "Ah, mon petit ver de terre! qui aurait pu te *pogner* t'aurait croqué *la croc au sel*" . . .

L'eau d'*enmiance*¹ que, dans le conte de 'Thomas-bon-chasseur',² le roi envoie chercher à celui qui convoite la main de sa fille, ressemble par sa vertu salubre à l'eau 'de *la rajeunie*.' L'approche de la fontaine en est d'ailleurs gardée par toutes les bêtes féroces de la terre, et on ne peut y arriver qu'en traversant, à midi juste, un pont vitreux, quand les bêtes sont endormies. Après avoir baigné leur corps dans cette eau, deux personnages fabuleux plongent 'comme des canards,' et sans en éprouver le moindre malaise, dans un chaudron rempli de plomb et d'étain en fusion.

Au simple contact de la fontaine d'or, dont on parle aux contes de 'Ti-Jean et le cheval blanc'³ et de 'Le petit teigneux,' tout objet se change en or pur. Lisons les textes:

. . . Prenant la clef, (Ti-Jean *débarre* la porte que la sorcière, sa maîtresse, lui a défendu d'ouvrir). Un grand trou sans fond, et une échelle qui descend. "Dis-moi donc, ce que ça veut dire?" Prenant l'échelle, Ti-Jean descend, descend, descend. Rendu en bas, il fourre son doigt où ça reluit. Le retirant, il le trouve tout doré. C'est une fontaine d'or dans laquelle il a mis son doigt. Sorti de là, Ti-Jean essaie d'arracher l'or de son doigt; mais c'est impossible. . . .

. . . (Une autre fois,) l'ennui le prenant encore, le petit garçon descend à la fontaine d'or. Il était comme moi; ses cheveux étaient longs *effrayant!* Rendu au bas de l'échelle, il se fourre la tête dans la fontaine d'or, et sort de là avec une belle chevelure dorée. "Pour le coup, la vieille magicienne va me tuer!" Cherchant partout, il trouve une peau d'agneau, et s'en fait une bonne perruque, cachant bien ses cheveux d'or. . . .
(*Extrait du conte de 'Le petit teigneux'*⁴)

¹ L'origine de ce mot est incertaine. Peut-être est-il une corruption de 'Jouissance'?

² Recueilli à Sainte-Anne (Kamouraska), de Geo.-S. Pelletier.

³ Recueilli à Saint-Victor (Beauce), de Paul Patry.

⁴ Recueilli à Sainte-Anne (Kamouraska), en juillet, 1915. Conteur, George-S. Pelletier.

. . . Une fois les géants repartis [du château], le lendemain matin, Petit-Jean se dit: "Ils m'ont tant défendu d'ouvrir cette porte qu'il me faut y aller voir, aujourd'hui." *Pogne* la clef et ouvre la porte. Qu'est-ce qu'il aperçoit? Un *dalot* dans lequel, jour et nuit, coule de la *belle* or. Comme il se penche pour se regarder dedans, sa chevelure tombe dans l'or, et quand il la retire, c'est la plus belle chevelure d'or qui se soit jamais vue sur la terre. Voilà Petit-Jean pas mal en peine. "*Sacré!* ils vont *ben* s'apercevoir que je suis entré ici. Comment faire?" . . .

Les transformations qu'on raconte ailleurs ont trait à la restauration de la vue d'un personnage quelconque. Voici celle qu'on trouve racontée dans 'Les secrets du lion, de l'ours et du loup':¹

. . . Le lion dit à l'ours: "J'ai un secret: le roi est aveugle. Je n'aurais qu'à prendre une feuille de cet arbre-ci et à lui en frotter les yeux pour qu'il recouvre la vue" . . . Ayant tout entendu, le jeune homme [aveugle qui s'était caché] dans l'arbre prend une feuille, s'en frotte les yeux, et voit clair; prend une autre feuille, et la met dans sa poche. . . . Il arrive, le lendemain, au château du roi aveugle, et il lui dit: "Vous ne voyez rien. Moi je puis vous guérir si vous me donnez (une récompense)." Le roi ne regarde pas de donner une belle (récompense) pour recouvrer la vue. Le jeune homme prend donc sa feuille, en frotte les paupières du roi, qui, à l'instant, recouvre la vue. Bien content d'avoir d'aussi bons yeux qu'à l'âge de quinze ans, le roi (accomplit sa promesse). . . .

Une métamorphose de même nature s'accomplit d'une manière différente, au conte de 'Ti-Jean et le petit vacher':²

. . . Ti-Jean dit: "Vieux magicien, je *peut'*i emmener la belle princesse, *ast'heure*?" Le magicien répond: "Il me faut d'abord que tu me remettes la vue comme à l'âge de quinze ans." Ti-Jean trouve un petit pot de graisse [magique] dans son armoire, frotte les yeux du magicien avec la graisse. Le magicien voit clair comme à l'âge de quinze ans. "*Ast'heure*, vieux magicien, je *pourrai'*i emmener la princesse?"—"Non! répond le magicien; la princesse est bien trop belle pour que je te la donne, *ast'heure* que je vois clair comme à l'âge de quinze ans" . . .

Au moyen d'un charme semblable, dans le conte de 'Thomas-bon-chasseur',³ une plaie est miraculeusement guérie:

. . . Rendu au milieu du pont vitreux, Thomas-bon-chasseur entend un hurlement épouvantable. Réveillées, toutes les bêtes féroces l'entourent pour le dévorer, lui et sa petite jument. "Dans mon poitrail, dit la petite jument, je perds tout mon sang. Prends une pincée de graisse dans mon oreille gauche et mets-la à mon poitrail." Thomas-bon-chasseur met de la graisse au poitrail de la petite jument qui, guérie, reprend sa course vers la forêt. . . .

¹ Conté à Lorette, par Mme. P. Sioui.

² Recueilli à Sainte-Anne (Kamouraska), de Achille Fournier.

³ Recueilli à Sainte-Anne (Kamouraska), de Georges-S. Pelletier.

Des changements abrupts de nature sont aussi causés par des charmes dont la vertu est de produire l'invisibilité ou une puissance invincible. Nous passerons, toutefois, ce sujet sous silence, afin d'arriver plus tôt aux métamorphoses les plus remarquables, celles qui résultent d'enchantements ou de maléfices.

Victimes préférées des sorciers ou des magiciens, les princes et les rois de la légende sont souvent contre leur gré transformés en animaux ou en objets, et l'accomplissement précis d'une condition arbitraire et secrète peut seul les 'délivrer,' c'est-à-dire les ramener à leur état normal en détruisant l'effet du charme malfaisant.

Les enchanteurs sont tantôt des fées, tantôt des sorcières, ou des mendiants. Des géants apparaissent même, une fois, dans ce rôle. Un prétexte quelconque suffit à réveiller leur tendance pernicieuse, et, avec l'aide d'objets d'apparence anodine, ils accomplissent leur œuvre néfaste. Sans soupçons, leur proie est d'ailleurs impuissante. Ici, une princesse est changée en poisson, en petite jument, une belle pouliche brune ou en chatte blanche. Là, un prince devient un lièvre, un cheval blanc ou une bête féroce. Des gens sont ailleurs transformés en masses de sel ou en chicots de sapin sec. Sous l'empire de ces maléfices, un prince est métamorphosé en vieillard, un autre devient sec et immobile, et un troisième est soi-disant '*amorphosé* en rien du tout.'¹ Au conte de 'Ti-Jean et la chatte blanche,' les crapauds de la princesse ne sont rien moins que 'les plus beaux chevaux de la terre.'

Étudions ces faits mythologiques au moyen de citations textuelles:
(*Extrait, tiré de 'Le prince de l'Épée-verte':*²)

. . . Pendant que le bâtiment file et que la princesse de l'Épée-verte repose dans sa chambre, la vieille servante³ s'approche d'elle et lui met un collier d'or au cou, disant: "Tu seras poisson au fond de la mer tant que la mer sera mer et tant que la terre sera terre." D'un *crac*, la fille est *amorphosée* en poisson au fond de la mer; et le prince de l'Épée-verte devient sec et immobile, n'ayant que la vie. . . . Le prince, qui est comme mort, ne grouille pas, ne parle pas. . . .

(*Extrait, tiré de 'Les trois frères et la Bête-à-sept-têtes':*⁴)

. . . "Le soir, dans la chambre [nuptiale], le prince plante son sabre dans le milieu du lit. "Qu'est-ce que ça veut dire? demande la princesse; tu as planté ton sabre dans le milieu du lit." Il répond: "Mais pourquoi cette petite lumière que je vois, là?" — "Tous ceux qui s'en sont approchés, reprend la princesse, n'en

¹ Dans le conte de 'Le fou qui fait rire la fille du roi,' recueilli à Lorette, de Mme. P. Sioui, en août, 1914.

² Recueilli à Saint-Victor (Beauce), de Paul Patry, en 1914.

³ Une mendicante que le prince avait par charité prise à son service.

⁴ Recueilli à Sainte-Anne (Kamouraska), de Achille Fournier.

sont point revenus." Une fois la princesse endormie, le jeune homme se lève et s'en va voir la petite lumière. C'qu'il y a, là ? Une vieille magicienne, qui lui dit d'une voix criarde: "Tiens! Petit-Jean, prends donc cette *lité*¹ corde et touche donc à ces *tis* animaux." Petit-Jean prend la petite corde et met la main sur les petits animaux. Le voilà *amorphosé* en masse de sel, incapable d'en sortir. . . .

(Extrait de 'Prince-Joseph':²)

. . . . Voilà un an écoulé, et le roi attend toujours Ti-Jean, qui ne *ressoud* point. Ti-Pierre dit: "Papa, je vas y aller, moi." Sur son bâtiment Ti-Pierre part, marche, marche, et arrive à l'île où avait débarqué son frère. Il marche sur un beau chemin *gravé* et arrive là où une vieille femme garde les moutons du roi; *bande* son fusil pour tirer sur un mouton. La vieille dit: "Prenez garde de tuer un des moutons du roi, que je garde. Si vous le faites, ça ne sera pas bien." Ne l'écoutant pas, Ti-Jean tue un mouton. La vieille dit: "Je vous *amorphose* en masse de sel, dont vous ne pourrez plus sortir." (Et le voilà *amorphosé* en masse de sel). . . .

Certaines métamorphoses sont de nature particulière. Le sujet perd ou reprend sa forme première suivant qu'il revêt ou enlève une peau enchantée d'animal. Telles sont celles qu'on observe aux contes de 'Prince *en* nuit et bête féroce *en* jour' et de 'Le château de Félicité.'

Les circonstances dans lesquelles ces enchantements malfaisants se terminent, et les conditions variées dont l'accomplissement produit la 'délivrance' des victimes constituent une série intéressante de traits mythologiques qu'on peut caractériser par les termes suivants: 'délivrance' par (1) mariage, (2) par onction ou immersion, (3) par décapitation ou mise à mort, (4) par la destruction du charme (5) par l'expiration du terme fixé, (6) par l'accomplissement de conditions arbitraires et secrètes. Il arrive d'ailleurs de rencontrer deux ou trois de ces traits accidentellement réunis en un seul dans l'explication de la 'délivrance' d'un sujet. Expliquons-les ici au moyen d'exemples tirés des contes canadiens.

(2. 1.³ *Ti-Jean et la chatte blanche*:)

. . . . Ti-Jean arrive au petit château couvert de paille, et revoit encore la grande chatte blanche charroyant de l'eau avec ses crapauds. *Rrnyao*, *rrnyao*, et la chatte blanche plonge dans la cuve pleine d'eau et en ressort belle princesse. Et Ti-Jean en *tumbe* sur le cul d'admiration, tellement il la trouve belle. "Dis-moi donc, Ti-Jean, ce que tu cherches? Voilà

¹ Petite.

² Recueilli à Sainte-Anne (Kamouraska), en juillet, 1915. Conteur, Achille Fournier.

³ Ces chiffres indiquent que les traits 1 ('délivrance' par mariage) et 2 (par immersion) sont ici inclus.

bien ton troisième voyage ici." Sa réponse est: "Mon père le roi, vous savez, a trois paroles. Il a dit 'Celui qui m'emmènera la plus belle fille, c'est le *boute*, il aura ma couronne.'" Et il ajoute: "*Ast'heure*, je n'en vois pas de plus belle que vous sur la terre."—"Moi, dit-elle, je suis métamorphosée et je ne redeviendrai princesse que si le fils d'un roi m'épouse." Ti-Jean dit: "C'est bon! [je suis fils de roi]."—"Demain matin, ajoute-t-elle, je serai encore grande chatte blanche. Tu attelleras mes quatre crapauds à mon vieux carrosse, et nous nous en irons ensemble. . . ."

... "Le lendemain matin, [chez le roi], Ti-Jean *ressoud* avec sa princesse par la main. [Elle est si belle que] le roi n'en revient pas. Ayant attelé les crapauds, Ti-Jean arrive avec quatre chevaux sans pareils et un carrosse comme on en a jamais vu. . .

(1. 4. *Le château de Félicité*:¹)

... Rendu à sa maison, le vieux bûcheron dit à sa fille cadette: "Ma fille, un de nous—toi ou moi—doit sacrifier aujourd'hui sa vie à cause de la malheureuse brassée de petites branches que je viens de casser dans les bois. Le maître de la forêt est un roi métamorphosé sous la forme d'un petit lièvre. Si tu consentais à devenir sa femme, dans un an et un jour, il serait *démorphosé*." La fille répond: "Ah! s'il n'y a que ça à faire, je vas y aller." . . .

... Au château, le soir venu, le petit lièvre se transforme en beau prince, et dit à la fille du bûcheron: "[Ma femme,] ça durera pendant un an et un jour; car j'ai trois cent soixante-six peaux de lièvre, que j'aurai à mettre, une chaque jour. Une fois toutes ces peaux repassées, je redeviendrai le plus beau prince de la terre" . . .

... Après une quinzaine de jours, la jeune fille commence à s'ennuyer. Une idée lui venant, elle se dit: "Si je prenais toutes ces peaux de lièvre et les faisais brûler à petit feu dans la cheminée, ça lui prendrait bien moins de temps à redevenir prince *a'dmeure* . . ."

... Elle allume le feu, prend les peaux de lièvre et les fait brûler à petit feu. Quand la dernière peau achève de brûler, le petit lièvre entre: "Ah, ma femme! . . . c'est pour le coup que tu me perds . . .; car je suis le roi d'un pays éloigné. *Ast'heure*, il me faut partir et retourner chez moi. Si tu n'es pas capable de me retrouver d'ici à un an et un jour, tu ne seras plus ma femme" . . .

(1. 4. *Prince en nuit et bête féroce en jour*:²)

... [Le père et la fille arrivent] là où se trouve le beau bouquet [dans le jardin du château]. Qu'est-ce qui *ressoud*? La bête féroce. La fille commence à reculer, recule. "Ah, ah, mon amie! dit la bête, je ne veux faire ici de mal à personne. Mais, il faut que vous m'épousiez. Autrement, la vie de votre

¹ Recueilli à Sainte-Anne (Kamouraska), en août, 1915, de N. Thiboutot.

² Source indiquée plus haut.

père va y passer, parce que, il y a un an et un jour, il a cassé ce bouquet pour vous.”—“*Depuis que* c'est moi qui en suis la cause, elle dit, j'aime mieux vous épouser que de laisser périr mon père.” L'*habitant* prend la forêt et s'en retourne chez lui en *brillant*, pendant que sa fille reste au château avec la bête féroce — un homme *amorphosé* qui, le jour, est en bête féroce et, la nuit, en beau prince. . . .

. . . [Un soir, longtemps après,] le prince jette sa peau de bête au pied de sa *couchette*, se couche et s'endort. La fée, [qui avait appris son secret,] de son côté, prépare un bon feu dans la cour, et quand elle le voit bien chaud, elle vient sur le bout des pieds dans la chambre, *pogne* la peau et la jette dans le feu. “Eh, eh! tu m'as trahi!” crie le prince, en faisant un saut de quatre pieds de haut dans le lit. En trois bonds, il saute dans la forêt, où il disparaît . . . , en disant: “Ma femme, tu m'as trahi! Pour me retrouver, il faudra que tu uses une paire de sabots de six pouces d'épaisseur. Autrement, jamais tu ne me reverras.” .

(2. *Les quatre Vents*:¹)

. . . Ti-Jean s'en va trouver la vieille magicienne et dit: “Bonne vieille! c'que ça veut donc dire, tous ces chicots de sapin sec qu'on voit là?” Elle répond: “Ce sont tous des bâtiments que les géants ont *amorphosés* en masses de sel.”—“Qu'est-ce qu'il faut faire pour les *démorphoser*?”—“Prends ce petit pot de graisse et va frotter les chicots de sapin.” Il prend le petit pot de graisse, s'en va frotter les chicots de sapin sec, qui se *démorphosent* et deviennent autant de bâtiments avec matelots et capitaine à bord. . . .

(2. *Prince-Joseph*:²)

. . . Prince-Joseph dit: “Je gagerais bien que mes frères ont tué un des moutons du roi?”—“Oui, répond la vieille sorcière, et je les ai *amorphosés* en masse de sel.”—“Comment ça coûterait-*i* pour les racheter?”—“Pour les racheter, ça coûterait quatre cents piâtres.” Prince-Joseph donne les quatre cents piâtres à la vieille, qui dit: “Prenez ce petit pot de graisse, et frottez les buttes de sel; ce sont vos deux frères. . . .” Il frotte les buttes de sel, et voilà ses deux frères redevenus hommes. . . .

(2. *Les trois frères et la Bête-à-sept-têtes*:³)

. . . [Le cadet des trois frères] siffle *après* son lion et son chien; et, quand ils *ressoudent*, il leur dit: “Mon chien, mon lion! dévorez la vieille sorcière. Mais attendez un petit brin! Toi, vieille sorcière, il faut que tu fasses revenir mes frères.” Elle répond: “Prends le petit pot de graisse dans l'armoire et frottes-en ces petites buttes que tu vois là.” [C'est ce qu'il fait.] Voilà ses frères 'délivrés' et bien contents. Le lion et le chien ne font de la sorcière qu'une *gueulée*. . . .

¹ Recueilli à Sainte-Anne (Kamouraska), en 1915. Conteur, Archille Fournier.

² Source indiquée plus haut.

³ Recueilli à Sainte-Anne (Kamouraska), en 1915. Conteur, Achille Fournier.

(3. *Ti-Jean et le cheval blanc*:¹)

. . . Après le mariage, le roi remet sa couronne à Ti-Jean. Le vieux cheval blanc lui dit: "Mon Ti-Jean, tu es marié. Je viens donc te voir pour la dernière fois. *Àst'heure*, tue-moi et fends-moi en deux." Ti-Jean prend une hache, tue son cheval blanc, le fend en deux; et un beau prince en sort, disant: "Merci bien!" Le vieux cheval blanc était un prince que la vieille sorcière avait métamorphosé. . . .

(3. *Thomas-bon-chasseur*:²)

. . . Le troisième jour, Thomas-bon-chasseur dit: "Il faut que j'aille voir ma petite jument, qui m'a tant rendu service." Va voir. C'qu'il voit? Sa petite jument, couchée sur le côté, mourante. "Ah, ah! Thomas-bon-chasseur, je ne pensais pas que tu m'oublieras de même, moi qui t'ai tant rendu service."—"Ah, pauvre petite jument, que me faut-il faire?"—"Àst'heure, prend le vieux sabre avec lequel tu as tranché la tête du lion, et coupe-moi le cou; c'est tout ce que tu as à faire."—"Ah non, ma pauvre petite bête! je ne suis pas pour le faire; tu m'as trop rendu service."—"Thomas-bon-chasseur, fais ce que je te dis si tu veux être heureux dans le monde. . . . Tranche-moi la tête. Si tu ne le fais pas, ma vie est au *boute*." Thomas-bon-chasseur ramasse le vieux sabre et tranche le cou de la petite jument en détournant la tête. Il part sans regarder, mais, encore curieux, avant de sortir, il jette un regard. C'qu'il aperçoit? Une princesse encore plus belle que celle qu'il allait épouser. . . .

(5. *Cendrillon*:²)

. . . La vieille fée *ressoud* encore: "Bonsoir, ma fille! tu as l'air bien triste."—"Oui, *mémère*; mes sœurs sont parties pour la danse; et moi, elles n'ont pas voulu m'emmener. . . ." La fée demande: "Veux-tu y aller?"—"Ça me ferait bien plaisir d'y aller; mais je n'ai pas de robe."—"Vite, *grèye-toi*!" dit-elle en lui donnant une belle robe de satin rose et des pantoufles appareillées. La fée la rend encore deux fois plus belle qu'elle est, et l'envoie en disant: "Ne passe pas minuit, parce que, à cette heure-là, tu redeviendras *cendrouillonne*." Les plus beaux chevaux attelés à un carrosse sans pareil arrivent à la porte. Cendrillon *embarque* et arrive au bal. Voyant entrer une si belle fille, tout le monde arrête de danser pour la regarder. Vite-ment le prince s'approche d'elle et lui demande de danser avec lui. Elle danse et s'amuse tellement qu'elle oublie l'heure. Tout à coup elle lui demande: "Qu'elle heure est-il?" Pendant que minuit sonne, elle dégringole dans l'escalier, et redevient Cendrillon comme avant. Dans l'escalier elle perd une pantoufle, que le prince, courant après elle, ramasse. Revêtue en flanelle d'*habitant*, dans son carrosse, elle file chez elle. . . .

¹ Source indiquée plus haut.

² Recueilli à la Jeune-Lorette, en août, 1914, de Madame P. Sioui.

(5. *Ti-Jean et la chatte blanche*:¹)

. . . La princesse demande à Ti-Jean: "Que cherches-tu?"—"Un cheval, répond-il; nous sommes trois frères, et notre père le roi a promis sa couronne à celui de nous qui ramènera le plus beau cheval." La princesse dit: "Demain matin. . . , tu iras à mon écurie et tu prendras le plus galeux de mes crapauds. Une fois rendu chez ton père, tu le renfermeras, et, le lendemain matin, il sera devenu le plus beau cheval de la terre" . . . Et, le lendemain, son crapaud était devenu le plus beau cheval qu'on ait jamais vu, le crin en argent, et ferré en or. . .

(6. *Le coq, la poule et la vache*:²)

. . . Durant la nuit, la petite fille entend un train épouvantable. En se réveillant, elle pense: "Dis-moi donc ce qui se passe ici. J'ai peur!" Le train cesse et elle s'endort.

Quand elle se réveille, le lendemain matin, elle se trouve dans un beau château, le plus beau des châteaux. Le vieillard à grand'barbe? C'était un prince métamorphosé, qui, revenu à lui, dit: "Tiens! ma petite fillé, c'est toi qui m'as délivré. J'étais métamorphosé; mais je suis revenu parce que tu n'as pas oublié comme tes sœurs de donner à manger à mon petit coq, à ma petite poule et à ma vache. . . . C'est toi qui m'as délivré, moi et mon château. Il faut donc s'épouser. . . ."

(6. *Le prince de l'Epée-verte*:³)

. . . Un bon jour, voilà une tempête abominable; la mer est agitée, et il fait si noir qu'on ne peut rien voir. . . . Un *habitant*, qui reste vis-à-vis [de l'endroit où est emprisonné le prince de l'Epée-verte], se couche le long de la grève, pendant la tempête. Ce qu'il aperçoit? La sœur du prince métamorphosée en poisson, qui sort de la mer, et qui traîne à son cou une longue chaîne d'or allant jusqu'au fond de la mer. S'approchant de son frère, elle le prend par le cou, et en pleurant. . . . elle dit: "C'est la vieille [mendiante] qui nous a métamorphosés; mais si quelqu'un nous entendait sans que nous le voyions, il pourrait nous délivrer en coupant ma chaîne à cinq brasses sous l'eau, au moyen d'un marteau d'or de huit livres pesant et d'une tranche d'or massif. . . ."

Apprenant ça, le roi . . . , dans un *siffle*, fait forger un marteau de huit livres pesant et une tranche d'or massif; et il fait faire un habit à l'*habitant* pour qu'il plonge et coupe la chaîne avec la tranche.

. . . Au bord de la mer, le lendemain, l'*habitant* se couche à terre, au bord de la mer. Voilà une tempête épouvantable. . . . Le temps est tout blanc et la mer agitée. Tout à coup la princesse métamorphosée sort du fond de la mer, prend son frère par le cou; et . . . elle répète: "Si quelqu'un coupait la chaîne d'or, ça serait la délivrance." L'*habitant* se jette à la mer avec son marteau et sa tranche, et il se met à travailler. Pendant

¹ Source indiquée plus haut.

² Recueilli à Sainte-Anne (Kamouraska). Conteur, Achille Fournier.

³ Conteur, Paul Patry, de Saint-Victor (Beauce). Conte recueilli en 1914.

que le frère et la sœur se lamentent, il coupe la chaîne. Voilà le prince de l'Épée-verte et sa sœur revenus comme avant; mais quant au prince, lui, il est bien maigre . . . Ça fait si longtemps qu'il pâtit. . . .

(6. *La Sirène*:¹)

. . . Le lion dit à Georges: "Mon jeune homme, je vas t'indiquer où se trouve un roi dont le château est métamorphosé, au fond de la mer, sous cinq cents brasses d'eau. Pour descendre à ce château, où tu pourras *démorphoser* le roi et épouser la princesse, souviens-toi d'une chose: sur le château, au niveau de l'eau, il y a une croix plantée sur une colonne surmontant la cheminée. Si tu trouves la croix, tu es bon pour le reste" . . .

Le pigeon dit: . . . "Si je ne t'avais pas eu, je me serais noyé. J'arrive d'une place dont j'avais bien longtemps entendu parler. C'est de la ville d'un roi métamorphosé. J'y ai vu une croix, à fleur d'eau, en pleine mer. . . .

Toutes les informations prises du pigeon, [le jeune homme se change en aigle et] prend sa volée vers la croix sous l'eau. En y arrivant, il l'examine *comme'il faut*, et il y voit, tout le long, une petite crevasse. Il se change en chenille, descend dans la petite crevasse, le long de la croix, jusqu'à ce qu'il arrive à la cheminée. Rendu au pied de la cheminée, il aperçoit la princesse qui fait à dîner. Toujours sous forme de chenille il se glisse dans les plis de sa robe. Sitôt la nuit venue . . . , il demande à la princesse: "Comment peut-il se faire que ce beau château soit ainsi à cinq cents brasses sous l'eau?" . . .

. . . En *étendant* la table pour déjeuner, le lendemain, la princesse dit à son père: "Mais, *poupa*, je ne pourrai jamais me marier, ici, à cinq cents brasses sous l'eau: jamais *qu'on vous* connaît personne! *C'est bien pour le coup* que je vas rester vieille fille."—"Sais-tu, ma fille, ce qu'il faudrait faire pour te marier? Il faudrait tuer le serpent qui se trouve dans la savane rouge, fendre le serpent, prendre le pigeon dans son corps, fendre le pigeon, prendre les trois œufs dans son corps, et venir en casser un sur le bois de la croix. L'eau baisserait jusqu'à la cheminée. Prendre le deuxième œuf, le casser sur le bord de la cheminée. L'eau baisserait jusqu'au seuil de la porte. Prendre le troisième œuf, le casser sur le seuil de la porte; et les chemins seraient partout aussi secs qu'ils l'étaient auparavant. Tu peux être certaine, ma fille, que tu as le temps de mourir avant que tout ça soit fait."—"Ah, mon père, c'est plus que certain! je mourrai vieille fille." Le roi en est bien découragé.

Le soir, la princesse raconte tout à petit Georges, qui dit: "Princesse, je vas essayer." Georges, le lendemain matin, se transforme en chenille, grimpe dans la cheminée jusqu'au pilier, où il prend la crevasse; et, à la fin, il arrive à la croix. Sur la croix, il regarde de tous côtés, cherchant où est la savane rouge. Se changeant en aigle, il vole vers le soleil levant, arrive à la grande savane, et aperçoit l'animal de serpent, de soixante pieds

¹ Conteur, N. Thiboutot, de Sainte-Anne (Kamouraska).

de long, dormant au soleil. Se *mettant en lion*, il saute sur le serpent. Ce sont des cris, des *siffles* et des hurlements. Le lion dit, "Siffle, crie, hurle! Tu vas mourir quand même." Contre la force du lion, le serpent ne peut résister, et voilà que des morceaux de serpent *revolent icite* et là. Le serpent mort, le lion redevient homme; et Georges prend son canif, éventre le serpent. Après le pigeon qui s'envole vite, Georges, changé en aigle, donne à plein vol. *Pogne* le pigeon, l'éventre, prend les trois œufs dans son corps, les place bien soigneusement dans son mouchoir, et reprend son vol vers la croix sous l'eau. Se *jouquant* sur la croix, il prend un œuf et le casse sur le bois. L'eau baisse jusqu'à la cheminée. Descendu sur la cheminée, il casse un autre œuf. L'eau descend jusqu'au seuil de la porte. Tout le monde, dans la ville, est épouvanté. Arrivé sur le seuil de la porte, il y casse le dernier œuf. Voilà toute l'eau partie. Le roi et sa ville étant *démorphosés*. Georges, quelque temps après, épouse la princesse, que le roi avait promis à celui qui la 'délivrerait.'

Transactions of The Royal Society of Canada

SECTION II

SERIES III

SEPTEMBER 1916

VOL. X

The Contest for the Command of Lake Ontario in 1812 and 1813.

By BRIGADIER-GENERAL E. A. CRUIKSHANK, LL.D., F.R.S.C.

(Read May Meeting, 1916)

A small British naval force had been maintained on the lakes ever since the cession of Canada in 1763. This was known as the Provincial Marine or the "King's ships" and was administered by the Quarter-master-General's Department. It was organized in two divisions, one on Lake Ontario with a dockyard and depot at Kingston and the other for the service of the upper lakes with its depot at Amherstburg. A master-builder was employed at each of these stations with a certain number of shipwrights and other workmen for the construction, repair, and maintenance of these vessels after the close of navigation. As green oak timber had been invariably used in building them it was found that they became unserviceable in about eight years. An experiment had been tried to prevent rot by filling the space beneath the sheathing with salt which was pronounced fairly successful but was not generally adopted owing to the trifling expense it would cause. In time of peace the King's ships were usually employed in the transport of troops and public stores but occasionally carried civilian passengers and private merchandise. They were consequently manned by crews barely sufficient to navigate them. The nature of their service made it desirable that they should be of moderate size and light draught to enable them to cross the bars at the mouths of small rivers and approach landings in shallow water. Efficient seamen were not easily engaged, particularly since the beginning of the war with France, as the pay was low and the service monotonous with few opportunities for recreation while in port. Most of them were French Canadian *voyageurs* who seldom remained more than one season. Nor were the officers of a class to inspire much confidence. Captain Steel, the senior officer on Lake Ontario was seventy-five years of age and naturally anxious to retire. Lieut. Hugh Earle, next in rank, had married a

natural daughter of Sir William Johnson, which gave him a powerful family influence. He was considered an experienced and capable pilot and sailing-master. His appointment to succeed to the command was approved without question. Several of the subordinate officers were confidentially reported as inefficient and totally unfit for their duties.

Four vessels were in commission at the opening of navigation in the spring of 1812. One of these, the *Duke of Kent*, was so rotten as to be unfit for repair, and was only used as quarters at Kingston for seamen during the winter. The *Royal George* was quite new and considerably larger than any other vessel then afloat on the lakes, but her great draught of water was regarded as a serious defect for general service. Her armament was formidable consisting of twenty thirty-two pounder carronades. The brig, *Earl of Moira*, needed much repair and it had been proposed to lengthen her for the purpose of increasing her armament but this was eventually effected by respacing her ports so as to mount an additional gun on each broadside. She was entirely armed with eighteen pounder carronades. The schooner, *Duke of Gloucester*, had been considered the most useful vessel on the lake in time of peace, but was condemned as beyond repair. The construction of a schooner at York to replace her had just been authorized. It was proposed to arm her with ten twelve pounder carronades.

The removal of the dockyard and naval depot from Kingston to York had also been practically decided upon as a measure of safety and expedience. The main objections to its retention at Kingston were forcibly stated by Captain Alexander Gray, lately appointed an Assistant Quartermaster General.

"The impolicy of keeping the greater part of our means of defence for the Upper Province at a frontier post as defenceless and exposed as Kingston must be obvious. Here we have not only our marine establishment, (which entails the necessity of keeping the ordnance, ammunition, and stores of various sorts for the equipment of the vessels) but there is likewise the dockyard and depot of arms for the service of the militia, &c., and all within a day's march of a neighbour who would not let so favourable an opportunity of striking a blow escape him, should war be the result. A loss of this nature at the commencement of the war would be irretrievable and at once decide the fate of the province as the communication with the Lower Province would in all probability be cut off, so that we would have no opportunity of replacing the military stores, if we even possessed the means. And the destruction of shipping would leave the whole of our frontier bordering on Lake Ontario totally defenceless. At present the garrison of Kingston does not exceed 100 men of the Veteran Battalion

and many of these are totally unfit for active service. And the nature of the ground is so peculiarly circumstanced that the garrison and dockyard are separated from each other by the strait which forms the harbour of Kingston. The high ground from which alone the dockyard can be defended is also separated from it by the inlet called Navy Bay. Thus the garrison occupies one situation, the dockyard another, and the ground commanding it remains unoccupied."¹

As York was the seat of government and the headquarters of the commanding officer, the removal of the naval station would facilitate supervision. The harbour was larger, naturally more secure from surprise, and could be more easily fortified. Timber for ship building could be readily obtained from the neighbouring forests. The main disadvantage was the great distance from Montreal, the advanced base of supply and this fact ultimately prevailed over all other considerations and kept the naval station at Kingston throughout the war.

When the declaration of war became known, some batteries for the defence of the harbour were hastily constructed and armed with any guns which happened to be at hand. These fortifications were gradually strengthened and their armament increased. Semaphore telegraph stations were established for communication, and furnaces built for heating shot. A considerable force of militia was assembled from the adjacent country and kept in service until relieved by regular troops from Montreal.

The merchant shipping on the lake consisted of about thirty small sloops and schooners. Only about one third of these flew the British flag, the largest being the *Governor Simcoe*, a schooner of 130 tons. The remainder varied in size from twenty to ninety tons.

Sackett's Harbour had been selected as the American naval base. The roadstead there was commodious, safe and easily fortified. All kinds of timber were abundant in the vicinity. The town was small but the country near by was well settled. The brig *Oneida*, of 250 tons, and armed with sixteen twenty-four pounder carronades, was the only ship of war maintained by the United States government with the exception of several small craft employed as revenue cutters. She was a dull sailer of very light draught. An energetic effort had been made just before the opening of navigation to augment her crew, recruiting officers having even been sent into Canada for that purpose. Early in June, her commander, Captain Woolsey, began a vigorous campaign against smuggling and other alleged infractions of the customs and navigation laws. Three British schooners, the

¹ Report, March 9, 1812.

Lord Nelson, *Ontario*, and *Niagara*, were seized by him and carried into port as prizes on various pretexts. The *Lord Nelson* was duly condemned and sold, but after the lapse of a century, her capture was admitted to be illegal and compensation granted. It seems probable that this method of depriving a prospective enemy of his means of transportation was deliberately adopted in anticipation of the impending declaration of war.

When war was declared not less than thirteen American merchant craft were lying at ports in the St. Lawrence receiving or discharging cargoes. While among the Thousand Islands, attempting to return to lake ports, two of these were captured by British row boats from Kingston, sent out to intercept them and the others turned back and sought shelter under the guns of a battery at Ogdensburg. Had the *Royal George* and *Moir* been properly manned and well commanded all of these might easily have been taken or destroyed. There, however, they remained unharmed, until the conclusion of an armistice permitted their removal to Sackett's Harbour or Oswego, when they were purchased by the government and converted into gunboats or transports of a very useful type.

In the beginning of July the new schooner, *Prince Regent*, was added to the provincial marine and two weak companies of the Royal Newfoundland Regiment, many of whom had been fishermen and boatmen, were detailed for service afloat, nominally as marines, but in reality to assist in working the vessels. Until the end of October Earle had undisputed command of the lake. Troops, prisoners and stores of all kinds were transported from post to post with entire freedom and security and military operations were greatly facilitated thereby.

On July 19 the *Royal George*, accompanied by several smaller vessels, while on their way from Niagara to Kingston made a demonstration against Sackett's Harbour which caused much alarm. A revenue cutter was captured in sight of the port and sent in with a demand for the surrender of the *Oneida* and her prizes. The *Oneida* then attempted to escape but finding that impossible ran back into the harbour and anchored in a position to command the entrance with one broadside while the remaining guns were landed and placed in position on the high bank where a battery had already been constructed and armed with a single long thirty-two pounder. This gun as a matter of course far out-ranged any guns carried by the British squadron. As the *Royal George* approached her guns opened a slow, irregular and ill-aimed fire which had no effect although it was continued for two hours. No official account was given of this affair by Earle or any of his subordinates and there is no reason to believe that

he contemplated a serious attack or that his ships suffered any loss or damage.

Towards the end of the month two small schooners which had been armed and despatched by Woolsey to protect the vessels detained at Ogdensburg encountered the *Moir* and *Gloucester* ascending the river near Brockville. They succeeded in repelling a very feeble attack and reached Ogdensburg in safety, much to the disgust of the commandant at Prescott.

Earle attempted no other offensive operation until the sixth of October when the boats of the *Royal George* entered the mouth of the Genesee and brought off two small schooners and some sails and cordage from a warehouse on shore. Several other vessels lay at the upper landing three miles up the river but no attempt was made to take them. The lack of energy and decision shown by officers of the provincial marine convinced friends and foes alike of their incapacity. Whatever merits Earle may have possessed as a seaman he had demonstrated beyond any doubt his incompetence to command a squadron. On the other hand Woolsey showed no inclination to venture out upon the lake but devoted all his attention to fortification of his base and the conversion of merchant craft into gunboats. As the schooners he had purchased were unprovided with bulwarks they were armed with heavy long guns to enable them to engage at a safe distance beyond range of the carronades of the British ships. In September he laid down the keel of a ship-rigged corvette considerably larger than the *Royal George*. This vessel was designed in the first instance to carry twenty-six thirty-two pounder carronades and was named the *Madison* in honour of the President. By that time the Secretary of the Navy had become convinced of the supreme importance of securing the command of the lakes and Captain Isaac Chauncey, the superintendent of the navy-yard at New York, was appointed as commandant of the naval forces to be employed as it was considered that a practical knowledge of ship-building was quite as essential as nautical skill. Chauncey was believed to possess both these qualifications and was known to be a careful and prudent officer. His instructions were dated August 31 but he did not arrive at Sackett's Harbour to take over the command until October 6. Before leaving New York he had sent forward one hundred and forty shipwrights, one hundred and seventy seamen, mainly volunteers, and more than one hundred cannon, generally of large calibre, with large quantities of round and grape shot, ammunition, small arms, gun-carriages and other necessary stores. Most of the carriages had been made and the shot cast since the date of his appointment.¹

¹ Chauncey to the Secretary of the Navy, New York, Sept. 26, 1812.

He was accompanied from Albany to Sackett's Harbour by the zealous and energetic governor of the State who displayed his anxiety to assist him in every way. They were much delayed by bad roads as the autumn rains had already set in. The *Oneida* was quite ready for service but the gunboats were not yet fully armed. Woolsey was sent away to Oswego to purchase several more schooners. One hundred seamen then on the road from Albany were ordered to that port to bring them on as soon as they were ready. "The mail comes to this place but once a week, Chauncey wrote soon after his arrival, "and the deputy-postmaster is an ignorant cobbler, who suffers the letters to be examined by any person who chooses to go into his shop, consequently letters to public officers may be purloined by spies or other ill-disposed persons without difficulty."¹

The movement of men, guns and stores had been greatly delayed by bad roads and low water in the Mohawk River and Wood Creek. Growing impatient at this loss of time, Chauncey went to Oswego but returned immediately as none of the guns or stores had yet arrived.²

On the evening of November 2 a strange sail was reported looking into Henderson's Harbour seven miles distant. As an unarmed transport was then expected from Oswego loaded with guns and stores of value Chauncey became alarmed for her safety and ran out in the *Oneida* in the hope of intercepting this hostile ship. The night was very dark with occasional squalls of rain. At daybreak he was within five miles of Kingston and when the morning mist cleared away the *Royal George* and two schooners were seen riding at anchor about the same distance to windward. Chauncey then stood southward until in sight of Oswego when he ran back to port along his own shore and was much relieved to find that his transports had safely arrived.

By this time he had obtained information which satisfied him that his squadron would be much superior in men and guns to any force he was likely to meet. Accordingly on November 8, he sailed again with the *Oneida* and six schooners, mounting in all forty guns and carrying 430 men. His first object was to intercept any vessels that might be returning from the head of the lake. If successful in this, he would then make a dash at Kingston which he hoped to take by surprise. Steering for the False Ducks he soon came in sight of the *Royal George* and chased her into the Bay of Quinte but lost sight of her in the darkness. During the chase a merchant schooner was seen lying at a wharf at Ernestown where she was burned by a schooner detached for that purpose. On the morning of the 9th the *Royal George* was again discovered in the channel heading for Kingston. As the wind blew

¹ Chauncey to the Secretary of the Navy, Sackett's Harbour, Oct. 6, and Oct. 8.

² Chauncey to the Secretary of the Navy, Oct. 21.

directly into the harbour he followed her in with his whole force under a lively fire from the batteries on shore. The engagement lasted for two hours in the course of which a heavy gun burst on the schooner *Pert*, disabling that vessel and doing much damage. Several other vessels were considerably injured in their hulls and rigging. At sunset Chauncey withdrew his vessels very skilfully with the intention, he declared, of renewing the attack in the morning. The wind blew in heavy squalls all night from the west and when day dawned he determined to follow the advice of his pilots and regain the open lake before the weather grew worse. While beating off, the schooner *Simcoe* came in sight making for Kingston and was chased but made her escape by desperately running over a reef and gaining the harbour but sustaining such damage that she sank in shoal water. Another merchant schooner was captured in the course of the morning. Two days later one of his schooners captured a sloop near the Ducks in sight of the *Moir*a which refused to engage and kept on her course for Kingston. When this was reported to Chauncey, who had by that time returned to Sackett's Harbour with the remainder of his squadron, he sailed at once in the hope of intercepting her but was driven back into port by a drifting storm of snow. His supremacy on the lake then seemed so firmly established that he embarked guns and ordnance stores for the troops at Niagara and announced that he was prepared to transport men to any part of lake and co-operate with the land forces in any enterprise they would undertake. He seriously contemplated another attack on Kingston if the weather proved favorable.¹

Nine days later he reported the successful launch of the *Madison* "a beautiful corvette-built ship," of 540 tons. "Nine weeks before," he wrote, "the timber of which she was constructed was growing in the woods."²

The most important result of his cruise was the separation of the British vessels, by which the *Prince Regent* and *Gloucester* were compelled to lay up for the winter at York and the others at Kingston.

Captain Gray reported soon after the close of navigation that "the officers of the marine seem to be destitute of all energy and spirit and are sunk into contempt in the eyes of all who know them. The want of seamen is so great that the *Royal George* has only seventeen men on board who are capable of doing their duty and the *Moir*a ten." Under these circumstances it seemed scarcely possible to save these vessels from capture or destruction whenever the lake again became navigable. An officer who had lately returned from Sackett's

¹ Chauncey to the Secretary of the Navy, Nov. 17, 1812.

² Chauncey to the Secretary of the Navy, Nov. 25.

Harbour on parole, told him that Chauncey had openly boasted of his power to do this.¹

Gray then boldly proposed an attack upon Sackett's Harbour while the lake was frozen. As far as he could learn no sufficient precautions had been taken for its defence and the garrison did not exceed a thousand militia, wretchedly armed, sickly and discontented, in addition to a single company of regular artillery, the seamen, and shipwrights employed in the navy yard. The length of march from Kingston was forty-five miles. At Gravelly Point, fourteen miles away, the enemy had established an advanced post of two hundred militia in a log blockhouse which must first be taken. Thence for the rest of the way the road led through dense woods only broken occasionally by small clearings and isolated settlements.

"The force requisite for this service," he said, "need not be very great. I should imagine one good regiment, exclusive of what may be collected here would be sufficient. If your Excellency approves of the suggestion I have taken the liberty of submitting, the preparation may be made below and the men destined for this service provided with snowshoes and trained in the use of them. I am aware that this enterprise is not without risk; there is, however, every prospect of success as this post is very distant from succour. I believe Albany is the nearest point from whence they could be reinforced with effect, which is as far distant from Sackett's Harbour as Montreal is from hence. If the troops from the Lower Province are put in motion about the latter end of January they should reach this in good season for making the attack. They should not be more than ten days in reaching this in light marching order.

"They need not be above a month absent from Montreal. Either the King's Regiment (with its flank companies) or the flank battalion would be sufficient for this purpose. The principal thing to be apprehended would be the intelligence of our movements reaching the enemy. But if the enterprise is conducted with despatch, the blow would be struck before he could avail himself of any information he might receive. We would require three or four pieces of artillery on sleighs to destroy any blockhouse or temporary works he may in the meantime run up."²

After his arrival at York he renewed this proposal.

"The more I reflect upon that subject the more I see grounds for hope as well as fear. What I apprehend is the probability of the enemy's strengthening his post by temporary means which he has so much at his command, such as abatis and barricades of wood of which

¹ Gray to Prevost, Kingston, Dec. 3; Gray to Prevost, York, Dec. 11.

² Gray to Prevost, Kingston, Dec. 3.

he has plenty, and axemen and carpenters in abundance. I know what an active enemy may do in that way and they have an idea we may make the attempt. The only alteration I would propose in the means of attack is in some measure to the field artillery to break down any temporary defences, (for such they must be as the season will not admit of any other), which they may in the meantime erect."¹

At the same time he asked that ten or twelve guns of suitable calibre should be forwarded at once to arm the batteries constructed for the defence of Kingston and York. Four twelve and the same number of long eighteen pounders were accordingly ordered up from Montreal and Quebec. He recommended the immediate construction of a ship designed to mount thirty thirty-two pounder carronades at York and a ship of the same class as the *Royal George* at Kingston. Both of these proposals were approved but considerable delay took place as shipwrights had to be engaged and sent up from Quebec. An experienced builder was appointed superintendent of both dockyards and instructed to proceed to Kingston with 128 shipwrights and carpenters. They arrived at that port on December 28. Fifty were retained there and the remainder sent on to York. Gray's proposal for an attack upon Sackett's Harbour was reserved for further consideration as it seemed doubtful whether so many troops could be detached from the Montreal District without endangering it.

Gray then asked that four more heavy guns should be sent forward without delay "for the preservation of our marine," he wrote, "is a point upon which I feel the greatest anxiety." This request was approved and the officer in command of the Royal Artillery at Quebec was directed to forward two long eighteen pounders and two sixty-eight pounder carronades. Iron-work and naval stores for the two new vessels were at the same time despatched from Montreal.

About the middle of October Prevost had written both the Secretary for War and the Commander-in-Chief strongly urging the necessity of supplying experienced officers and seamen from the Royal Navy to man the ships of war on the lakes. After the attack on Kingston in November, 1812, he renewed this application which had been forcibly supported by Sir John Borlase Warren who had recently assumed command on the North American station. The Executive Council for Upper Canada had also presented an address in which they declared that the maintenance of naval superiority on Lake Ontario was indispensable to the preservation of that province.

Lieut. Colonel Bruyeres, the senior officer of the Royal Engineers in Canada, reported on January 19, 1813, that he had conferred with Colonel John Vincent, then commanding at Kingston "on the measures

¹ Gray to Prevost, York, Dec. 11.

necessary to be adopted for the security of the post and the marine establishment so as to retain the ascendancy on the lake. The latter is a very serious and difficult task which must require the greatest exertions and assistance from the Lower Province to arm the new ship that is now building, for unless this vessel is completely armed and manned, it will not be possible to effect a junction with the ships at York.....It is much to be regretted under present circumstances that the whole of the naval establishment has not been concentrated at this post. It would have saved much time and expense in transport, united all the workmen under one head, and insured the armament of your ships. It would then only have been necessary to have secured this post against attack until your fleet was fully prepared and equipped to proceed on the lake. The evil is now without remedy and the best must be done to concentrate and unite as soon as possible, but by no means to venture from hence until your vessels are rendered fully efficient with men and arms."

On his arrival at York about the end of the month, Bruyeres found that all naval construction had been held up owing to an unfortunate difference of opinion between Captain Gray and the superintendent of the dockyard as to the best place for carrying it out. This was only settled by a reference to Major-General Sheaffe who was then slowly recovering from a dangerous illness.

"I must candidly observe to Your Excellency," Bruyeres wrote from that place on January 28, "that I have a much more unfavourable opinion of the possibility of obtaining an ascendancy on the lake than I had when at Kingston. There are so many difficulties to be surmounted and this country is so totally deprived of resources or means within itself that the distance becomes a very serious obstacle, particularly as the armament for these new ships must entirely come from Lower Canada and ought if possible to be sent complete during the winter for the enemy are fully prepared to commence their naval operations immediately on the opening of navigation. York may undoubtedly in time of peace be made an excellent harbour and dockyard, much preferable to Kingston, but under present circumstances it is totally incompetent for the purpose and the latter must be made use of until York will be well established."

Satisfactory progress was made on the ship at Kingston, although it was found necessary to dismiss two master builders in succession and a strike was attempted by the workmen which was only terminated by the appearance of a body of troops under arms. Early in February the entire frame was set up and the whole work so well advanced that Captain Gray was recalled to Montreal. The *Moir* was repaired

and the construction begun of a schooner of the same size as the *Prince Regent* and several gunboats for service in the St. Lawrence.

At York, however, owing chiefly to the incapacity and obstinacy of the superintendent who was flatly accused of disobeying or ignoring every order he received, little was accomplished and on the 24th of March the officer in charge reported little prospect of launching the ship before the beginning of June at the earliest.

Chauncey had increased his squadron by the purchase of four more merchant schooners which were armed with heavy long guns like the others. He laid down a fast pilot-boat schooner for reconnoitering and carrying despatches. He had the full support of his government and the President wrote to General Dearborn who was in command of the land forces co-operating with him: "The command of the lakes by a superior force on the water ought to have been a fundamental part in the national policy from the moment the peace (of 1783) took place. What is now doing for the command proves what may be done."¹

About the middle of January, Chauncey received private information from Kingston which gave him considerable anxiety and he proposed an attempt to destroy the vessels lying there before they could form a junction with those wintering at York.

"My plan is," he wrote, "to prepare all my forces this winter and in the spring as soon as the ice breaks up, to take on board one thousand picked troops and proceed to Kingston, land them about three miles westward of the harbour in a bay, which I have marked on the chart herewith enclosed, leave two vessels to cover their retreat, (if such a measure should be found necessary,) proceed with the remainder of the squadron to the harbour of Kingston and attack the forts and ships, at the same time the troops would attack in the rear. With this force I have no doubt but that we should succeed in taking or destroying their ships and forts and of course preserve the ascendancy on the lake."²

Before this letter reached its destination, William Jones, an experienced shipmaster, had succeeded Paul Hamilton as Secretary of the Navy and had written to him in the strongest terms, urging activity.

"It is impossible to attach too much importance to our naval operations on the lakes," he said. "The success of the ensuing campaign will depend absolutely upon our superiority on all the Lakes."

Chauncey was instructed to build another corvette of such dimensions as he deemed proper.

¹ Madison to Dearborn, Oct. 7, 1812, Writings, Vol. II, p. 547.

² Chauncey to the Secretary of the Navy, January 21, 1813.

"Indeed," the Secretary added, "you are to consider the absolute superiority on all the Lakes the only limit to your authority."¹

A formal memorandum was presented to the Cabinet on the 8th of February proposing the capture of Prescott and Kingston and the ships of war lying there as the first object of the coming campaign, the capture of York and the two frigates reported to be in course of construction there, the second, and the reduction of Forts George and Erie on Niagara River as the third. This was approved eight days later.

General John Armstrong, the new Secretary of War, had some military experience, and firmly believed that he was endowed with a great genius for war, which would enable him to direct these operations from his office-chair. He warmly urged an attack upon Kingston before the ice broke up. "If the enemy be really weak at Kingston and approachable by land and ice," he wrote, "Pike, (who will be a brigadier in a day or two,) may be put in motion from Lake Champlain by the Chateauguay route in sleighs and with the two brigades cross the St. Lawrence where it may be thought best, destroy the armed ships, seize and hold Kingston until you can join him with the other corps destined for the future objects of the expedition, and if pressed by Prevost before such juncture can be effected, he may withdraw himself to Sackett's Harbour or other place of security on our side of the lake. This would be the much shorter road to the object and perhaps the safer one as the St. Lawrence is now everywhere well bridged and offers no obstruction to either attack or retreat. Such a movement will no doubt be soon known to Prevost, and cannot but disquiet him. The dilemma it presents will be serious, either he must give up his western posts or to save them he must carry himself in force and promptly to Upper Canada. In the latter case he will be embarrassed for subsistence. His convoys of provisions will be open to our attacks on a line of nearly one hundred miles and his position at Montreal much weakened. Another decided advantage will be to let us into the secret of his strength. If he be able to make strong detachments to cover or recover Kingston, and to protect his supplies and after all maintain himself at Montreal and Lake Champlain, he is stronger than I imagined or any well authenticated reports make him to be."²

The successful attack upon Ogdensburg and a report that Prevost had arrived at Kingston with a large force caused the immediate abandonment of this plan. Instead of attempting an attack on Kings-

¹ The Secretary of the Navy to Chauncey, January 26, 1813.

² The Secretary of War to General Dearborn, February 24.

ton Pike's troops were hastily transported to Sackett's Harbour in sleighs for its defence. This movement was made during extremely cold weather and many men were disabled by frost. Chauncey had then been absent at New York for more than a month. "I am satisfied that *if he had arrived as soon as I had expected him we might have made a stroke at Kingston on the ice,*" Dearborn remarked, "but his presence was necessary for having the aid of the seamen and marines."

Prevost's hurried visit to Kingston and the movement of some small reinforcements to that post from Montreal had in fact been caused by his anxiety for the safety of the dockyard and shipping.¹

Active efforts to recruit seamen at Quebec for service on the lakes had not been very successful and the few men who were engaged were not of a satisfactory class. One party of thirty-five arrived at Kingston about the end of December and another of eighteen came on a month later. So great was the scarcity of the necessary artificers that sailmakers and riggers were borrowed from the transports wintering in the river.

When Prevost's arrival at Kingston was reported to Dearborn at Albany he ordered the whole of troops quartered at Greenbush and most of those at Plattsburg to be moved as rapidly as possible in sleighs to Sackett's Harbour and started in post haste for that place himself, arriving in fifty-two hours from the time of departure.

The whole of the militia of the neighbourhood was called in, augmenting the garrison to three thousand of all ranks and arms, exclusive of seamen and marines. Confidential but incorrect reports received from Kingston represented that between six and eight thousand men had been assembled and that an attack might be expected within forty-eight hours. Ten days later twelve hundred regular infantry arrived and a feeling of security was restored. Chauncey returned on March 7 and a council of war held on the 10th, at which he was present, decided that no attack ought to be made on Kingston until the naval force could co-operate. He proposed that preparations should be made and information given out to induce a concentration of troops for its defence, when he would embark a sufficient force to take possession of York and afterwards attack Fort George. This plan was immediately approved by General Dearborn and Colonel Macomb. Chauncey was very confident of success as he had obtained reliable information that York was practically without means of defence. The sanction of the Secretary of the Navy was easily secured.

"The general arrangement you have made for the attainment of the important objects of your command promise complete success on Lake Ontario," he wrote, "and I trust those you have made at Erie,

¹ Prevost to Bathurst, February 6.

tho' less forward, will not be less certain. The naval superiority necessarily and effectually includes the military command of both shores and it is impossible to appreciate too highly the ascendancy for which we are contending with an active enemy, stimulated by motives equally strong and imperious."¹

The keel of another ship was laid down on April 8 and work pushed on so rapidly that he confidently expected she would be ready to launch about the first week in June.

"She will be a beautiful ship, nearly as large as the *Essex*," Chauncey wrote, "and I calculate to mount twenty-six long twenty-four pounders upon her for the purpose of battering the forts at Kingston."

Meanwhile Captain Gray had been instructed to return there and make every effort to concentrate the entire British naval force on Lake Ontario at that port as soon as navigation opened. He had already strongly recommended the removal of most officers of the Provincial Marine as none of them were considered fit to command a ship of war. He recommended the retention of Earle and three lieutenants as sailing-masters. With reference to the former, Gray reported: "I am ready to admit that his conduct as an officer has been much and justly censured for want of spirit and energy, both in relation to his conduct before the enemy and the discipline and interior economy of his ship. But as he is a good private character and an experienced pilot for the lake and perfectly acquainted with all the duties of a sailing-master I consider it more conducive to the good of the service to reduce him to that situation than to dismiss him at the present moment."²

He stated that one post-captain, three commanders, seven lieutenants, and 445 petty officers and seamen would be required to man the vessels on the lake in an effective manner. When the ship under construction at York and the ship and schooner at Kingston were completed and equipped the squadron would be nearly equal in force to that opposed to it.

The *Prince Regent* succeeded in sailing from York as soon as the harbour was clear of ice and arrived off Kingston on April 17. That port was still frozen up but she was able to gain the protection of the batteries on shore until the ice broke up. Gray reported, however, that an inspection showed her "to be in such a disorderly state that the want of talents or want of attention to his duty on the part of the master was apparent in every part of the vessel."³

¹ The Secretary of the Navy to Chauncey, March 27.

² Gray to Prevost, March 12, 1813.

³ Gray to the Military Secretary, April 13.

The commander of the *Moir*a was soon after put under arrest by him for neglect of duty "as the outfit of that vessel has been retarded by him so much that she is not ready for sea after an outfit and repair of nearly four months."¹

The *Gloucester* had been unable to sail from York because the necessary repairs to make her seaworthy had not been made.

Chauncey on the other hand had fully completed all his preparations for the expedition against York. On the night of April 18, the ice in Sackett's Harbour broke up suddenly and within a few hours had almost disappeared. All his vessels were then ready for sea and in a letter, dated next day, he announced his intention of sailing with the first fair wind to execute his plan if no orders to the contrary were received. The letter from the Secretary approving this, did not, however, arrive until the 21st, although it was dated on April 8. Eighteen hundred soldiers were embarked on the 22nd in expectation of a favourable wind, and General Dearborn also went on board. In compliance with Dearborn's urgent request although contrary to his own judgment, Chauncey got under way next morning but before gaining the lake a fierce squall of wind, accompanied with heavy rain, struck the squadron and materially damaged some of the vessels. As not more than half the troops could find shelter below, he returned to his anchorage and began repairs.

"I am particularly anxious," he wrote, "to get the troops to the place of destination as soon as possible for crowded as they now are on board the different vessels, they as well as my own men will very soon become sickly. We have on board the *Madison* about 600 souls and many of the smaller vessels are more crowded than ourselves."²

Sailing on April 25 with a fair wind his squadron of fourteen sail, including one unarmed transport, arrived in sight of York at dawn on the 27th. A suitable anchorage for disembarking was selected about a mile southwest of the principal battery which had been constructed to command the entrance to the bay, and as near shore as seemed safe. An open space near the ruins of the French fort was indicated as the point of landing. Very clear and explicit orders were issued for this operation which began at eight o'clock and continued for two hours under cover of a steady fire from the larger vessels. As a strong breeze sprang up from eastward many of the boats were carried to leeward and thus became exposed to rifle-fire from a small body of troops hidden in the woods. When most of the troops were ashore Chauncey ordered the schooners to take up a suitable position

¹ Gray to Colonel Halket, April 24.

² Chauncey to the Secretary of the Navy, April 24.

to engage the main battery. They were accordingly obliged to beat to windward under its fire, which proved a task of some difficulty. They finally gained a position within six or seven hundred yards from which they opened a steady and fairly well directed fire from two thirty-two, two twenty-four and ten long twelve-pounders. The battery was originally armed with two long twelve pounders to which had been lately added two old eighteen pounders, condemned as unserviceable because their trunnions had been broken off. In anticipation of an attack these guns had been stocked and mounted on timbers. During the action a twelve pounder of the same description was brought up. They were served by a bombardier and twelve gunners of the Royal Artillery assisted by infantry soldiers from the regulars and militia, partially trained for that duty. This contest had lasted for about half an hour without much harm to either party when one of the gunners in the battery by careless handling of a portfire ignited the contents of a travelling magazine behind him which exploded with disastrous effect. A dozen men were instantly killed and many others dreadfully burned. Two officers who had ascended the parapet to observe the effect of their fire were thrown to the ground with great violence and stunned. The gun platform was torn up and an eighteen pounder dismounted. The ghastly spectacle of dismembered bodies and the fearful sufferings of the wounded demoralized many men who had escaped injury. The fire of the battery ceased while that of the vessels was accelerated to augment the confusion. By great exertions on the part of the remaining gunners the battery was cleared of the wreck, the magazine was replaced, and firing resumed. About an hour later three strong columns of American troops were seen advancing by as many routes which would bring them into the flank and rear of this battery, laboriously dragging with them by hand six or eight field guns which they had succeeded in landing. One gun was traversed in that direction and fired several times upon them without effect as no ammunition had been provided except round shot. All the guns were then spiked and the battery abandoned before an assault was attempted. Most of the militia had already dispersed as they had never entirely recovered from the shock of the explosion. Chauncey's squadron then entered the bay without further opposition and he lost no time in landing a considerable force of seamen and marines. The movement upon the town was much delayed by the loss of time in building bridges over several ravines and small streams to facilitate the passage of their guns. The loss and disorder caused by the unexpected explosion of the principal magazine delayed their advance still more and enabled the remnant of the British regular troops and artificers to set fire to

the buildings and dockyard and effect their retreat without effective pursuit. When the American advance guard at length entered the town they found the principal storehouse and the hull of the new ship which had been named the *Sir Isaac Brock*, so completely wrapped in flames that it was impossible to save them. An unsuccessful attempt had also been made to destroy the *Duke of Gloucester* which lay aground much out of repair. A small merchant schooner became a prize.

Late in the afternoon Chauncey accompanied Dearborn on shore and created a very favourable impression by his courtesy to a deputation of the inhabitants appointed to arrange terms of capitulation. Next morning, however, a party of seamen, who had remained in the town all night and become intoxicated, created great alarm by setting fire to the Parliament buildings and plundering shops and private dwellings.

The threat of an attack on Kingston had been successful in detaining troops and guns there which had been intended for the defence of York. The number of regular troops in garrison numbered less than five hundred of all ranks and arms, belonging to four different corps. One hundred and sixty-three were reported killed, wounded or missing, being thirty per cent. Three hundred local militia were paroled.

The expedition had achieved a considerable success not without serious loss. Of the troops employed, General Pike and seventy-eight others were killed or died of wounds and two hundred and fifty officers and men were wounded. Besides these two midshipmen and four seamen were killed and fifteen or twenty seamen wounded.

The destruction of the ship and naval stores accumulated for her completion was a great disappointment as a large gang of shipwrights had been brought from Sackett's Harbour purposely to put her in a fit state for launching. These men were immediately set to work on the *Gloucester*, which was soon got afloat and repaired sufficiently to be towed off as a prize. Twenty guns of several different calibres, most of them unserviceable, were taken, besides a considerable quantity of arms and ammunition in transit to other posts.

"The loss of stores at this place will be an irreparable loss to the enemy," Chauncey wrote confidently, "for independent of the difficulty of transportation, the articles cannot be replaced in this country. The provisions and clothing also taken and destroyed will be a serious loss to him. If we succeed in our next enterprise, (which I see no reason to doubt), we may consider the upper province as conquered."¹

¹ Chauncey to the Secretary of the Navy, May 7, 1813.

The wounded were embarked on two of the schooners which were ordered to return without delay to Sackett's Harbour, but were driven back to port by a heavy gale. The remainder of the squadron prepared to sail to Niagara on the morning of May 1. The wind, which until then had blown moderately from the east, increased to a violent gale accompanied by heavy rain. This continued for six days during which Chauncey remained weather-bound in the bay, his flagship riding with two anchors ahead and lower yards and topgallant masts struck. The health of the troops was soon affected, particularly on the smaller vessels where they were crowded together so closely that less than half of them could find shelter between decks and many were not only exposed to the rain but to the waves which dashed over them. On the 8th the wind dropped and he was able to cross to the Four Mile Creek, east of Fort Niagara. The soldiers were reduced to a thousand effective men and more than a hundred seamen were unfit for duty. Two schooners were at once despatched to the mouth of the Forty Mile Creek and Burlington Bay to destroy depots of stores and provisions reported there. The remainder of the squadron sailed for Sackett's Harbour after landing the troops. Arriving there on May 11, Chauncey detached four schooners to Oswego to take on board stores which had arrived from New York. During his absence one hundred and fifty fine seamen had come in from the seaboard. These men more than replaced his losses.

His next step was to send a flag of truce to Kingston, ostensibly to liberate a wounded officer on parole but actually to obtain as much information as possible about the state of the British squadron. The officer employed on this mission reported on his return that the four largest vessels were ready for service and the new ship had her lower masts in and rigging and tops overhead. He had seen an officer of the Royal Navy who asked him many questions about the new ship at Sackett's Harbour. Chauncey also obtained a Montreal newspaper published on May 1, which stated that eight officers of the Royal Navy had passed through that city on their way to Kingston a few days before. Under these circumstances he considered that it would be imprudent to leave Sackett's Harbour entirely without naval protection. Two schooners, the *Pert* and *Fair American*, were accordingly directed to proceed at once to Niagara with troops and then return and cruise off the port until they could be joined by the remainder of his squadron. On May 17, all the other vessels except the *Madison* and *Lady of the Lake* sailed for Niagara with 1,100 soldiers on board. They were favoured with a fair wind and reached their destination in thirty-six hours. Four days later, the garrison having strongly reinforced, Chauncey embarked 350 artillerymen and fol-

lowed with the two remaining ships. He had then been informed that Sir George Prevost was on the way from Montreal to Kingston. The wind was light and he did not arrive off Niagara until the 25th. The bombardment of Fort George by the batteries on the opposite side of the river began at daylight and it was subjected to a cross-fire from numerous heavy guns employing hot shot by which in a few hours every wooden building within its walls was soon wrapped in flames. The garrison was driven out and the enemy's fire was next directed on the town with destructive results.

On the following day Chauncey made a careful reconnoissance of the Canadian shore from the mouth of the river to the Four Mile Creek in his barge. During the night soundings were taken and buoys placed to mark the stations to be occupied by his vessels in protecting the landing. The British batteries were silent while this was being done as it was considered necessary to economize ammunition. As there was every indication of fair weather orders were given to land a large body of troops about a mile west of the town at daylight on May 27. Dense fog and a dead calm obliged the schooners to sweep slowly into their positions. When this was accomplished and the fog lifted the two small batteries near the lighthouse were assailed by an overwhelming fire from the heavy long guns of five of these vessels which silenced them within a quarter of an hour. Three other schooners anchored close to the shore to cover the landing and search the plain and adjoining woods with their fire. The *Madison* and *Oneida* and 124 large rowboats were employed in transporting troops. Whenever a British party appeared to oppose the landing, it became the target for a steady and well directed fire of grape and canister which inflicted severe loss and eventually compelled it to retire in disorder. The marines of the squadron landed after the third brigade of infantry was on shore. The wind had then begun to blow so hard that the situation of the ships became dangerous. A signal was made to weigh anchor and enter the river which was obeyed about noon. Chauncey reported the loss of but one man killed and two wounded. His vessels had received no damage. Their effective fire was beyond a decisive factor in this operation as it not only wrecked and made the land batteries untenable and covered the landing but actually drove the enemy from the field with severe loss.

On the following day, Captain O. H. Perry with fifty-five seamen was despatched in the schooner *Hamilton* with instructions to land at Lewiston and proceed to Black Rock and remove the vessels which had been blockaded there for several months to Erie where the squadron on that lake was to concentrate for future operations. Another officer accompanied him for the purpose of bringing down a supply

of ammunition for Chauncey's squadron. The lack of seamen was still felt to such an extent that he declared if none arrived by the time he returned to Sackett's Harbour he would be obliged to lay up his ships to man those on Lake Erie.¹

On the 20th of April the new ship at Kingston was launched and her name changed from the *Sir George Prevost* to the *Wolfe* by the special request of the Governor-General. It was then hoped that she would be fully rigged and ready for service in twenty days. Gray reported with unwonted enthusiasm that she was "as fine a vessel of her class as ever sailed under the British pendant." The other vessel which had been laid down as a schooner was found to exceed greatly the dimensions proposed. Instead of 140 tons she would measure 250 with scantling fit to carry heavy guns. He recommended in consequence that she should be rigged as a brig to enable her to take a place in the same line of battle as the rest of the squadron.² Two large gunboats were built on the advice of Colonel Pearson, the commandant at Prescott. "They are calculated for the calms so prevalent on Lake Ontario and by taking prompt advantage of such a moment, one of the boats in question could tease and cut up the largest vessel in such a way as to force it to shift its station, if not perhaps, to capture it. As during these calms our vessels of a larger description will necessarily keep in port, it is proposed to man these boats with the best seamen, (30 in each), armed with pistols, cutlasses, tomahawks, and boarding-pikes, also to put in such a boat an officer and 40 regulars. When the occasional service is at an end, the sailors to return to their vessels and the soldiers to their corps."³ A plan for the protection of the water communication between Kingston and Montreal was also approved and five gunboats were stationed at the River Raisin, Cornwall, and Lachine for convoy service.

Early in March, Captains Barclay, Finnis and Pring, and six lieutenants from the ships under his command had been selected by Sir John Borlase Warren for service on the lakes in compliance with the request of the Governor General. "They are all active, zealous, young officers," he wrote, "and I doubt not, will cheerfully promote the service they are appointed to, with all the exertion in their power."⁴ Two of the lieutenants were left at Halifax to prepare gun-tackle and rigging, which they were instructed to bring on in the first frigate sailing for Quebec after the opening of navigation with a small party of gunners and petty officers. Barclay and the other officers went on

¹ Chauncey to the Secretary of the Navy, No. 30, May 29.

² Gray to the Military Secretary, Kingston, April 20.

³ Captain J. E. Irwin to the Military Secretary, Kingston, March 29.

⁴ Warren to Prevost, Bermuda, March 5, 1813.

at once by the difficult overland route, having to march on snow-shoes a great part of the way. Barclay arrived alone on the 20th of April having left his companions behind at Madawaska. On the 23rd he set off for Kingston to take over the command on Lake Ontario. He received instructions to make such changes among the officers and crews of the vessels as he deemed expedient and to require from other branches of the service all the assistance practicable to gain complete naval ascendancy. The Governor General had then received information that the number of seamen under orders to come out from England had been increased from two to three hundred and that they would probably sail about the end of March.¹

Barclay took up his duties with much energy. He found the *Royal George*, armed with twenty thirty-two pounder carronades and two long nine pounders, the *Moir*, carrying ten eighteen pounder carronades and four long six pounders, and the *Prince Regent* of ten twelve pounder carronades and two long sixes fully equipped and ready for sea, waiting for their crews to be completed. The *Wolfe* lay alongside the wharf taking in her masts and would be ready for her guns and crew in three weeks. These ships, he said, were as fine vessels of their class as he had ever seen. He decided to take command of the *Wolfe* himself and appointed Pring to the *Royal George* and Finnis to the *Moir*. Gray had already collected timber for a ship to replace the one destroyed at York a few days before and had made a recommendation for that purpose. "There is every reason to suppose that a vessel of this description may be built in four or five weeks," he said, "in short something must be done to recover the loss we have sustained at York, and this seems to be the only means of recovering our naval ascendancy.

"I am far from thinking the cause lost, as we have still entire the principal part of our naval force and with the addition of the *Sir George Prevost*, (*Wolfe*), and the brig on the stocks, I have every reason to believe we shall be able to cope with the enemy. It is, however, advisable to put this matter past a doubt by persevering in our exertions in the dockyard."²

On the 12th of March the number of officers and seamen under orders for service on the Canadian lakes was further increased to 448. Sir James Lucas Yeo, a young officer greatly distinguished for enterprise and daring, was selected to command. He had been promoted to be a lieutenant for merit at the age of fifteen. His capture of the frigate *Confiance* and the conquest of Cayenne were justly ranked among the most remarkable exploits of British seamen in recent years.

¹ The Military Secretary to Sheaffe, April 22.

² Gray to Sheaffe, May 4; Barclay to Sheaffe, May 5.

He had just entered his thirty-first year but his health was already considerably impaired by long period of hard service in the tropics. Next to him in rank and distinction was Captain William Howe Mulcaster of whom Earl St. Vincent had said that he "felt great pride in acknowledging as an *élève* of his own." He had served under Yeo for several years as first lieutenant and was attached to him by the closest ties of friendship and gratitude. Each of these officers had been wrecked in a terrific storm in the autumn of 1812. Most of the other officers were personally known to Yeo and had served with him in the past. The petty officers and seamen were mostly selected from among those lately employed in a flotilla of gunboats for the defence of Riga an experience which it was thought would prepare them for a Canadian winter.

Yeo's special instructions were dated a week later. "The first and paramount object for which a naval force is maintained being the defence of His Majesty's Provinces of North America," he was informed "we do hereby require you in the employment thereof to co-operate with His Excellency, the Captain-General and Governor-in-Chief of those Provinces, not undertaking any operations without the full concurrence and approbation of him or his commanders of the forces employed under him, and on all occasions conforming yourself and employing the forces under your command according to the requisitions you may from time to time receive to this effect from the said Governor or Commander of the Forces."¹

It was presumably anticipated that the venturesome disposition of the young Commodore would be kept in check by the prudence of older military officers.

The whole detachment arrived at Quebec on May 5, having made an unusually rapid passage across the Atlantic and were sent on at once. They passed through Montreal on the 11th and it is recorded that the first division of one hundred and fifty reached Prescott six weeks to a day from the date of their embarkation at Plymouth. The ascent of the river was slowly and toilsomely accomplished in heavily laden bateaux. Yeo with the first division, accompanied by the Governor-General arrived at Kingston on the 16th. The remainder of the officers and seamen came on within the next eight days.

The *Wolfe* was not yet decked nor rigged and the whole of her armament had not arrived from below. The officers loaned by Warren had to be disposed of to make way for those specially selected by the Admiralty, as Yeo naturally wished to retain the latter with him. Barclay was accordingly appointed to command on Lake Erie

¹ Commission, March 19.

and Pring on Lake Champlain. Their subordinate officers and petty officers went with them.

An officer of the provincial marine taken at York and just released on parole, estimated that five thousand troops were then assembled at Sackett's Harbour but their objective could only be conjectured. On May 24 Prevost informed Vincent at Niagara that in ten days the squadron would be ready "to go forth to dispute the ascendancy on Lake Ontario with the enemy; a series of exertions have led to this state of forwardness in our naval preparations. I am much mistaken if Commodore Chauncey is not over-matched. Our little squadron will consist of the *Wolfe* carrying four sixty-eight lb. carronades and fourteen eighteen lb. long guns. The *Royal George*, the *Moir*, the *Regent* and *Sir Sidney Smith* are all as well manned."¹ Two days later in a despatch to the Secretary of the Admiralty Yeo stated that the *Wolfe* was armed with twenty guns collected from the forts or brought up from Quebec. Since their arrival all hands had been busily employed in fitting her out. "The enemy's vessels," he added gloomily, "are very superior both in number and the complete way they are equipped, consisting of one ship of twenty thirty-two pounder carronades and six long twelve pounder guns, a brig with eighteen twenty-four pounders and sixteen smaller vessels, each carrying a long thirty-two pounder gun, some four and others six carronades, besides which they have also a ship of thirty and a brig of eighteen guns nearly ready for launching at Sackett's Harbour.

"They having the above advantages on the lake at present and the certainty of their being shortly reinforced by those building it will appear evident to their Lordships that the enemy, (now possessing a force which are equal if not superior), if not checked, will soon get too formidable for an attack to be made upon them which might prove advantageous, I am therefore about to proceed to sea to meet them, as the possession of Upper Canada must depend on whoever can maintain the naval superiority on Lake Ontario."²

Information had been received that the American squadron had sailed from Sackett's Harbour on the 20th and landed troops near Fort Niagara on the following day and was still lying at anchor there by the latest accounts. Prevost advised Yeo to sail at once with all the vessels that were ready to reconnoitre and decide on the practicability of transporting a small reinforcement of troops to the Niagara line.

Shortly after noon on the 27th Yeo returned with information that the whole of the enemy's ships were out of the harbour and

¹ Prevost to Vincent, May 24.

² Yeo to Croker, May 26.

he strongly advocated an immediate attack upon their dockyard and naval base before their return. Prevost consented readily enough and before dark some eight hundred men from the garrison of Kingston, composed of detachments from seven different corps were embarked in gunboats and bateaux which rowed out to join the ships lying off the port. Their intention was to sail at once with the object of reaching their destination before daybreak but the wind failed and delayed their departure until morning. While still ten miles distant from Sackett's Harbour their approach was discovered by the two American armed schooners on the lookout which immediately made all sail firing alarm guns. The wind continued light and baffling. At two o'clock in the afternoon the British squadron had scarcely come any nearer. A considerable body of troops was seen near the town and a large flotilla of boats approaching the harbour from the direction of Oswego filled with men. All hope of surprising the place must be abandoned. A gunboat accompanied by a party of forty Indians in three canoes who had accompanied the expedition started off to attack these boats some of which soon ran ashore on an island. As the wind still continued to be contrary the troops who had been embarked in bateaux in readiness to land, were again brought on board the ships, and it was decided to return to Kingston. No sooner was their course altered than the wind shifted and it became as difficult to beat away from the harbour as it had been to approach it before. Then a rowboat from the island was seen approaching with a flag of truce. An American officer came on board with a proposal to surrender the party which had landed on the island and been attacked by the Indians. An escort was sent back with him and eight bateaux with one hundred and fifteen prisoners brought off. The remainder of this detachment consisting of two hundred United States dragoons evaded pursuit and reached Sackett's Harbour in safety. This unexpected and easy success was taken as a sign that no very resolute resistance was likely to be offered by the garrison and brought about another change of plan. The squadron came to anchor in the bay several miles from the port. All the boats were ordered to assemble near the *Wolfe* at midnight and land the troops before daybreak on Horse Island covered by the guns of the *Beresford*, *Sidney Smith* and gunboats. This landing was successfully carried out and the troops opposing them were expelled from the island and two field guns and several prisoners taken with small loss. The passage of the ford leading to the mainland was next forced and another field gun captured. The American schooners had run up the river out of reach and their crews joined the troops assembled for the defence of the town. This was a rather motley body of more than fifteen hundred

men composed of United States dragoons, artillery and infantry, many of them invalids, Albany volunteers, local militia, seamen and dockyardmen. Many of the militia appear to have behaved badly and were of little service. Prevost and Yeo landed and joined the troops advancing to attack the works defending the port and dockyard. The ships and brig were unable to approach within range of the batteries, which were sited on a high bluff, owing to calms and light baffling breezes. Mulcaster in command of the schooners and gunboats was unable to find a satisfactory position and his light guns had little or no effect. The woods through which the troops landed were compelled to advance were found to be obstructed by abatis felled by Colonel Macomb in the winter when an attack was expected. They were obliged to move by narrow tracks, clearing away obstacles as they slowly advanced under an effective fire. A veteran officer declared "that the musketry was heavier than anything I ever saw, except the 21st of March in Egypt."¹

Many officers and more than a third of the men were killed or woulded before they forced their way to the open ground in sight of the batteries and blockhouses defending the port on the land side. Every attempt to cross this was quickly repelled by a heavy fire of artillery and small arms. Captain Gray fell mortally wounded while closely reconnoitering this position. The effective force available for an assault had been reduced by casualties, stragglers, and men engaged in caring for the wounded, one eyewitness states to less than three hundred and another to one hundred and fifty. Those who were still in the ranks were much exhausted by hours of exposure to rain during the night in open boats, by fatigue and hunger. The enemy's force in sight seemed to have rather increased than diminished. A premature rush forward was easily checked and an order given to retreat to the landing place. This movement was accomplished without any active pursuit but many of the wounded who were unable to walk were necessarily left behind and became prisoners. Two of the captured guns were even carried off in the boats. The troops engaged lost forty-eight killed and two hundred and eleven wounded or considerably more than thirty per cent of their number. Yeo reported the loss of one seamen killed and one midshipman and four seamen wounded. The action lasted about four hours and the survivors of the landing party re-embarked at nine o'clock in the morning. Both Prevost and Yeo had exposed themselves fearlessly to a very heavy fire.

When the attacking force appeared before the works and seemed to be on the verge of success, Commodore Chauncey's brother, who

¹ McDouall to Freer, May 29.

was in charge of the navy yard, gave orders to set fire to the buildings and ships at the docks. These instructions were carried out and he retreated across the river with his men. After the retirement of the assailants he returned and made energetic efforts to quench the flames. The ship on the stocks and the prize schooner *Gloucester* were saved with little damage but the barracks and storehouses with their contents were totally destroyed. Among these were the sails and cordage for these vessels with many valuable stores including almost everything captured at York. "The loss of the canvas is a serious inconvenience," Chauncey wrote, "as the sail-makers must remain idle until I can replace it from New York." Altogether the value of buildings and stores thus destroyed was estimated at five hundred thousand dollars.¹

A head wind delayed the return of the squadron to Kingston and during the afternoon the Governor-General became so anxious that he decided to embark in a canoe with his staff and thus arrived there the same evening, twenty-four hours in advance of the ships. He then received official information of the capture of Fort George by the enemy which seemed to place the entire province in a most critical position. Much must depend on the effective action of the squadron. Yeo's first step was to recommend the immediate construction of another ship and the purchase of the schooner *Simcoe*. Prevost approved and Captain Richard O'Connor was appointed naval commissioner to prevent delays and misunderstandings which had in the past proved so injurious.

On the evening of May 50, Chauncey had received an alarming message that on the morning of the 28th the whole British squadron had been seen approaching Sackett's Harbour. Early on the following day he got under sail, stood over toward York and thence ran eastward along the north shore in the expectation, he stated, of meeting Yeo on his way up the lake with reinforcements of troops. Failing in this he passed Kingston at one o'clock on the afternoon of June 1 and arrived at Sackett's Harbour three hours later. He then first received information of the attack on that place and the damage that had been sustained.

The *Beresford*, cruising as a lookout outside Kingston, saw and reported the movement of his squadron. "I am therefore after them," Yeo wrote in haste to Lieut. Colonel Evans of the 8th, "I will thank you to send me this evening all the bread you can procure and as the

¹ Baynes to Prevost, May 30; Brenton to Freer, May 30; Captain Robert McDouall to Freer, May 29; Yeo to Croker, May 31; Brown to Tompkins, May 29 and June 1; Chauncey to the Secretary of the Navy, Sackett's Harbour, No. 30, June 2.

squadron are very short of marines I should wish much if you could spare us a few of your fine fellows for the day of action."

Prevost, however, sedately counselled caution and learning that day that Vincent had retreated from Niagara toward Burlington Heights instructed him to take on board his ships two hundred men of the 8th as a reinforcement with a much needed supply of clothing, ammunition, and provisions and co-operate with that division. This delayed his departure from Kingston until the morning of June 3.

Next day Chauncey wrote to the Secretary of the Navy in a very serious mood: "I beg to call your attention to the situation of the naval forces on the lakes. I have under my command on this lake 14 vessels of every description, mounting 62 guns, well manned and well appointed. The enemy have seven vessels and six gunboats, mounting 106 guns; well officered and manned. If he leaves Kingston I shall meet him. The result may be doubtful but worth the trial."

Now on the afternoon of the 3rd Yeo had appeared off the harbour and lingered there for several hours apparently in the expectation that Chauncey would come out. His squadron could hardly have escaped observation. Arriving off York on the 6th he received a message stating that Vincent had been the victor in a night attack upon his pursuers at Stoney Creek, a few hours before, and stood over toward the mouth of the Niagara and thence bore along shore toward the head of the lake to locate the positions of the opposing forces on land. The appearance of his ships caused the garrisons of the forts to remain under arms all night in apprehension of an attack. Late on the afternoon of the 7th they were seen close in shore from the American camp near the mouth of the Forty Mile Creek and here too the whole force stood to arms during the night. At dawn the two schooners were within a mile of the shore. Tents were being struck in great haste and many large boats, in which the baggage had been transported, were hauled up on the beach. It was a dead calm. The *Beresford* and *Sidney Smith* were towed in closer by their boats and opened fire. Four field guns replied with round shot heated in an improvised furnace. An officer with a flag of truce was sent on shore to demand a surrender. This was of course refused. Soon after the boats on the beach were loaded and pushed off, escorted by a guard on shore. After they had rowed eastward for about three miles a breeze sprang up and the *Beresford* gave chase and rapidly overhauled them, taking or destroying twelve with a large part of their baggage. It was afterwards ascertained that their reconnoissance of the mouth of the Niagara had created so much alarm that General Dearborn sent a message recalling all his troops to Fort George.

At noon Yeo anchored off Burlington Bay and communicated with Vincent who assured him that he felt perfectly secure in that position as long as the lake remained under his control. Being informed that the enemy were breaking up their camp at the Forty Mile Creek, Yeo was requested to return there and co-operate with a small force advancing by land. Arriving off that place shortly before dark, the detachment of the 8th was landed and took possession of the deserted camp with a considerable quantity of stores. Twenty large boats, including those driven ashore in the morning, were taken or destroyed. The great advantage to be derived from prompt and effective co-operation from the squadron at this time was fully recognised and very clearly stated by Lieut. Colonel John Harvey, Vincent's chief staff officer.

"The principal objects General Vincent has had in view in making a forward movement with the greatest part of the troops to this place, (Forty Mile Creek), are to communicate and give every support and assistance in his power to Sir James Yeo and the fleet and to be at hand to take advantage of the success which we sanguinely anticipate from his approaching encounter with Commodore Chauncey, to give encouragement to the militia and yeomanry of the country, who are everywhere rising upon the fugitive Americans and making them prisoners, and withholding all supplies from them, and lastly, (and perhaps chiefly), for the purpose of sparing the resources of the country in our rear and drawing the supplies of the army as long as possible from the country in the enemy's vicinity. Our position here secure all these important objects, and so long as our fleet is triumphant, it is a secure one. Should any disaster, (which God forbid), befall that, we have no business *here* or in this part of the country. We have just been, (Gen'l Vincent and myself), on board the *Wolfe*. She is a *war* vessel indeed, and, Sir James Yeo says, admirably manned, as are, I understand, the rest. We have given them, however, 60 volunteers from the King's to assist and a few gunners and bombardiers for the heavy carronades. Sir James, I am happy to observe, is fully impressed with the necessity of having a *commanding* breeze before he makes his attack. In a light one or calm the enemy's flotilla of small vessels would have an incalculable advantage. There is scarce a breath of air at this moment. The moment there is wind he proposes sailing to attack. The anxiety with which we shall witness and await the result you may readily conceive."¹

On the other hand General Dearborn very justly attributed all his embarrassments to the temporary loss of the command of the lake.²

¹ Lieut. Colonel Harvey to Colonel Baynes, June 11, 1813.

² Dearborn to the Secretary of War, June 20.

Cruising eastward close into the American shore on the 13th of June, Yeo observed two merchant schooners and several bateaux approaching Fort Niagara. They were chased into Eighteen Mile Creek and captured. They were loaded with hospital supplies and other valuable stores for the American army. Prisoners taken on this occasion stated that a depot of provisions had been formed at the mouth of the Genesee River. A party of seamen was landed there and brought off several hundred barrels of flour and pork with a sloop loaded with grain. A hundred tons of pressed hay were burned. On June 19 the squadron came to anchor in Oswego bay and a landing party was embarked in boats, but observing that batteries had been constructed and armed and an armed schooner moored across the mouth of the river, this design was abandoned. Yeo then sailed westward to Great Sodus Bay where he arrived next day. Two small schooners loaded with supplies and bound for Sackett's Harbour were taken on the way. A landing was effected in the face of some opposition by a strong body of militia in which a few men were wounded on either side. Six hundred barrels of provisions were removed and the storehouses burned. After cruising between Oswego and Sackett's Harbour for a week longer in the unfulfilled expectation of intercepting boats engaged in the transportation of stores, Yeo returned to Kingston on June 28 to receive supplies and refit his squadron, having held command of the lake for twenty-five days. The moral as well as the material advantage of these operations was considerable.

Chauncey had quickly abandoned his intention of seeking an encounter, if indeed, he ever seriously entertained it. On June 10 a boat came in from Niagara with information that three days before the British squadron had been seen off the mouth of that river steering westward. At the same time he learned that General Dearborn's advanced troops had received a serious check. "Immediately upon receiving this information," he wrote, "I prepared to proceed in quest of the enemy, but upon more mature reflection I have determined to remain at this place and preserve the new ship at all hazards. My feelings upon this occasion can better be imagined than described; on the one hand I had the prospect, (if I succeeded against the enemy), of immortalising myself; on the other hand if I was beaten, the loss and disappointment to my country would be irreparable. The only question was whether I was to fight for my own aggrandisement or that of my country? If the latter there could be no question as to the course that I ought to pursue, which was to put nothing to hazard; for by remaining here four weeks I could prepare the new ship for service, and with her I should consider myself as having the complete and un-

controlled command of the lake; without her the enemy has near a fourth more guns than I have, as many men and as good, and his officers are experienced and brave. With such a disparity of force I trust you will approve of my determination of putting nothing at hazard until the new ship is fitted, I have the satisfaction of knowing that every commissioned officer on this station coincides with me in the opinion as to the propriety of remaining in port until we can fit the new ship."¹

He added that the loss of stores by fire during the attack would cause a delay of three weeks in the equipment of this ship which was launched on the 12th and named the *General Pike*. On the 14th a flag of truce came over from Kingston, ostensibly to release some wounded prisoners but inquiries made by the officer in charge led Chauncey to suspect that his true mission was to ascertain whether all his ships were in port and thus ensure the safety of transports proceeding up the lake without convoy. To verify this conjecture, the *Lady of the Lake* commanded by his brother was ordered to sail that night to the vicinity of Presqu' Isle and cruise close into the north shore to intercept any such unarmed craft that might venture out. On the 16th this vessel captured the schooner, *Lady Murray*, with a valuable cargo of hospital stores and clothing bound from Kingston to York. Prisoners taken in her said that a new brig, intended to carry twenty guns had been launched at Kingston and several large gunboats were under construction.²

A few days later he received information which he considered reliable that four thousand troops had been concentrated at Kingston, probably with the intention of making another attack upon Sackett's Harbour, and that Oswego was then being menaced by Yeo for the purpose of diverting his attention. His agent reported that boats were held in constant readiness for this expedition. The new brig would be ready for service by July 1 and six large gunboats and two galleys to carry heavy guns were being built. He instantly resolved to build another fast sailing schooner of 250 tons for which he had both materials and guns on hand. "This vessel will not be required," he remarked, "if the enemy keeps the lake until I get the *General Pike* ready, for whenever the two fleets meet upon the lake, the mastery will be decided and the conqueror left without a rival. I am only apprehensive that he may go into Kingston and wait there until all his force is ready in which case he would have the superiority."³

¹ Chauncey to the Secretary of the Navy, No. 38, June 11.

² Chauncey to the Secretary of the Navy, No. 45, June 18.

³ Chauncey to the Secretary of the Navy, No. 49, June 21; Chauncey to the Secretary of the Navy, No. 52, June 24.

To mislead his opponent he circulated a report that the *Pike* could not be made ready for service before August 1, and to confirm this, gave orders for her cables and anchors to be detained at Oswego Falls.

Late in the afternoon of July 1, Chauncey received the amazing information from a deserter from the Royal Newfoundland Regiment, who had just come in, that Sir James Yeo had crossed the lake the night before with between eight hundred and a thousand picked men in open boats and then lay concealed in the thick woods on Chaumont Bay about seven miles distant with the intention of making a surprise attack upon his ships that night. This man stated that Sir James had landed there about daybreak that morning, hauled up his boats and covered them with green boughs. He intended to head the attack on the *Madison* himself while the other vessels were to be boarded at the same time. "The plan was well arranged," Chauncey remarked, "and if it had been attempted there would have been a dreadful slaughter on both sides." He kept his whole force under arms in apprehension of attack but daylight returned without unusual incident. The squadron then got under way and ran outside in the hope of intercepting the British force while returning toward Kingston but could discover no sign of it. Going on board the *Lady of the Lake* Chauncey examined every part of Chaumont Bay without result. At sunset he returned into the harbour and anchored, taking the same precautions for the defence of his ships as the night before. Two more deserters came in during the night with information that Yeo had abandoned his design and re-embarked shortly after dark on the previous evening, informing his men that he had received positive information from the town that their presence was known and preparations were being made to cut off their retreat and this was confirmed by the appearance of two guard vessels cruising outside the harbour. He assured them that the enterprise would only be postponed for a few days as it was his full intention to return some dark and stormy night when he anticipated complete success.

Yeo's high reputation in fact rested largely on his success in conducting daring cutting-out expeditions and boarding parties. On this occasion his force consisted of no more than 450 seamen and marines of the Royal Newfoundland Regiment and 250 of the Royal Scots and 100th. As the force then assembled at Sackett's Harbour on the most reliable authority was estimated to amount to not less than four thousand soldiers and seamen, success could only be expected as the result of complete surprise. The desertion of two men of the Royal Newfoundland, which was discovered late in the afternoon, made this clearly impossible and his situation became one of

great peril. While reconnoitering in the outer harbour in his gig he observed that the ships were being manned in great haste and preparations being made to repel boarders. His decision to retreat was promptly taken and carried out with great skill. Embarking at ten o'clock and rowing hard all night his force reached Kingston next morning with a loss of five men by desertion. "I must acknowledge that the failure of Sir James's expedition is a cruel disappointment," General de Rottenburg wrote from his advanced position at Four Mile Creek near Niagara, "However, *à mauvais jeu, il faut faire bonne mine*, and I am determined to hold my ground as long as possible."¹

Chauncey's prudent decision to avoid an action and his untiring efforts to increase his force had made it evident that he intended to risk nothing until he had obtained a decided superiority in men and guns. Prevost accordingly addressed another urgent appeal for assistance to Admiral Sir John B. Warren.

"As our means of equipping and manning our navy on the Lakes bear no proportion to those of the enemy, who are increasingly employed in promoting their great object of obtaining an ascendancy upon them, I beg leave most urgently to request of you a supply of seamen without which aid, should the contest be much longer continued, we shall labor under disadvantages which no skill and valor on the part of the small band of seamen under Sir James Yeo can counterbalance. Whatever assistance you can give me on this head, will, I trust, be promptly afforded, as everything will probably depend on the operations of the next two months. A less reinforcement than 200 seamen would be of little avail, and with it I should feel confident in the means of successfully opposing the American fleet on both lakes."²

Meanwhile all effective men of the detachment of the Royal Newfoundland Regiment at Kingston were detailed for service afloat and as these were found insufficient in number for the needs of the service, a hundred were added from the 100th. For the protection of supplies ascending the St. Lawrence, Yeo organised a flotilla of nine gunboats, each armed with a single long gun or carronade, and formed into three divisions, one at Kingston, one at Prescott, and the third at Gananoqui to cruise among the Thousand Islands. Strict orders were given that no boats should ever be permitted to leave Prescott without an escort of gunboats and that whenever a division arrived at Kingston, it should return to Gananoqui to take over another convoy. Captain O'Connor, the Commissioner of the Kingston dockyard, was placed in chief command. As this flotilla was propelled

¹ De Rottenburg to Prevost, July 7.

² Prevost to Warren, June 24.

by 254 oars and required crews of 285 men, only a few able seamen could be allotted to each boat, the remainder of the crew being composed of soldiers who were regularly relieved at the end of each cruise or voyage.

The necessity for such precautions was soon demonstrated. At daybreak on July 18, two large armed boats from Sackett's Harbour, duly commissioned as privateers and manned by volunteers from the regular army and militia, after lurking for nearly two days among the islands, awaiting an opportunity, surprised and captured the small gunboat *Spitfire* and a brigade of fifteen heavily loaded bateaux at Simmond's Landing, without firing a shot. The prizes were soon taken into Cranberry or Goose Creek on the American shore, which was obstructed by felled trees to prevent pursuit and a stockade hastily built for their protection. This event was reported at Kingston on the morning of the 20th when three gunboats under the command of Lieut. John Scott, R.N., were ordered to search for them. During the afternoon the position of the enemy was ascertained but as it was growing dark, it was considered advisable to defer an attack until next day. On entering the creek it was found that the boats had been taken several miles farther up and a breastwork built for their defence with logs and captured barrels of provisions and biscuit boxes. While struggling to remove the obstructions in the channel the working parties were assailed by musketry from the woods and gunfire from the sloops and stockade. The troops then effected a landing with much difficulty owing to the marshy nature of the banks of the creek and finally drove the opposing riflemen into their defensive works. These were found to be difficult of approach owing to obstacles and strongly occupied. A reinforcement of several hundred troops was reported near at hand and the landing party was withdrawn, having suffered a loss of four men killed and two officers and sixteen men wounded among whom were one midshipman and four seamen. Captain Milnes, an aide-de-camp to the Governor-General, and an officer of much promise, was mortally wounded. The American loss was reported to be small but not definitely stated. The captured gunboat and some of the bateaux were scuttled during the action and much of the captured stores damaged by wet and rough handling. A few days later the privateers with their remaining prizes made their escape into Sackett's Harbour although chased by the *Moira* and damaged to some extent by her distant gunfire.

The new brig was launched on July 20 and named the *Melville*. She could only be manned by taking the requisite number of seamen from the other vessels.

"The two squadrons will be in as great force as they can be this year," Yeo wrote, "and immediately we are both ready a general action must take place, as every military operation depends entirely on whoever can maintain the naval superiority on the lake."

"I am happy to state only one seaman has deserted to the enemy, and their conduct has generally been orderly and good; every reasonable and proper indulgence has been given them to keep them in this temper, but the encouragement that is held out by the agents of the enemy, of which there are many in this province, may, I fear, seduce them in time." He declared that it was absolutely necessary that "more grown-up young men as midshipmen and seamen should be sent out, for even a victory over the enemy would not enable us to maintain the superiority without a reinforcement being sent immediately as the enemy from their rivers have every facility and means of whatever they stand in need of in a few days."¹

Learning that Chauncey had laid down a brig, he began the construction of a ship considerably larger than the *Wolfe*.

By this time Chauncey had been strongly reinforced with an excellent class of seamen drafted from ships of war blockaded in the Atlantic ports. Early in June he was joined by Captain Sinclair with more than eighty officers and men belonging to the crew of the *Alert*. The remainder of the crew of that ship and the greater part of the crew of the *Vixen*, recently exchanged, soon followed, accompanied by a hundred marines.² On June 29, thirty-five seamen and boys arrived from New York and on July 1, ninety-four came on from Boston. "These reinforcements will make us formidable with the assistance we shall receive from the army," he wrote.³

On that day, while under apprehension of an immediate attack he arrested a man of some local influence who was suspected with good reason of acting as a spy and communicating information. "It would be very desirable to hang this traitor to his country, as he is considered respectable in the country where he lives," he declared angrily, "and I think it full time to make an example of some of our countrymen who are so base and degenerate as to betray their countrymen by becoming spies and informers of our enemy."⁴

On July 16 Captain Crane arrived with the entire crew of the frigate, *John Adams*. Five days later came forty-five seamen from New York. Chauncey was thus enabled to detach with safety two schooners to Niagara, taking one hundred and thirty seamen for service

¹ Yeo to Croker, No. 6, July 16.

² Secretary of the Navy to Chauncey, June 14.

³ Chauncey to the Secretary of the Navy, July 1.

⁴ Chauncey to the Secretary of the Navy, July 4.

with the squadron on Lake Erie. A flag of truce sent over to Kingston to gain information, reported the whole of the British squadron still in port.¹

Some rather sarcastic observation by the Secretary of the Navy upon a previous letter, now provoked a petulant retort from Chauncey that "the *title* of Commodore Yeo and the *grade* of his officers carry with them neither *charms nor fears*. My mentioning them at all was to show that the enemy considered the command of Lake Ontario of sufficient importance to employ officers of experience in contending for it."²

He explained that heavy and almost continuous rain during the first three weeks of July had greatly retarded his operations but that he fully expected to sail on the 20th with his entire force except the prize brig, *Duke of Gloucester*, which he had renamed the *York*, but had condemned as unserviceable, and the two schooners already at Niagara. "I shall proceed off Kingston to allow the enemy an opportunity to give battle if he thinks proper, but which I think he will decline until his new brig is ready. If he should decline coming out, I shall proceed up the lake, communicate with General Dearborn, show myself off York, and return down the lake to my station off Kingston."³ Accurate information respecting the armament of the opposing squadron had convinced him of the advantage of arming his own vessels mainly with long guns. The armament of the *Pike* was consequently increased by mounting two more long twenty-four pounders on circles, thus giving her sixteen guns of that calibre in each broadside. Under favoring conditions this ship would be superior not only to any single vessel but to any combination of hostile vessels on the lake.⁴

Chauncey sailed on July 23 and crossed over to the other side of the lake. He then stood up the lake. His latest information convinced him that the British squadron would not be ready to come out for several days. Next day he met the *Lady of the Lake* returning from Niagara and received a letter from General Boyd in command there, proposing a joint attack upon the British advanced depot of supplies at Burlington Heights which was reported to be weakly protected. That vessel was sent back at once to receive troops and guides with a message stating that the entire squadron would be employed as he desired.⁵

¹ Chauncey to the Secretary of the Navy, No. 61, July 10 and No. 62, July 15.

² Chauncey to the Secretary of the Navy, No. 63, July 17.

³ Chauncey to the Secretary of the Navy, No. 65, July 19.

⁴ Mahan, War of 1812, II, 49.

⁵ Boyd to the Secretary of War, July 27; Chauncey to the Secretary of the Navy, August 4.

On the 25th Chauncey was rejoined by the *Pert* and on the 27th by the *Lady of the Lake* with 250 soldiers commanded by Colonel Winfield Scott and several refugees to act as guides. After a consultation with that officer it was considered advisable to embark more troops and the squadron stood over to Niagara where it arrived the same evening. Several hundred soldiers were taken on board and all sail set on a direct course for Burlington Bay but owing to light breezes and calms the squadron failed to come to an anchorage off the heights until late on the afternoon of the 29th. Two parties were sent on shore who were informed by friendly inhabitants that the garrison had been strongly reinforced that day. Militia and Indians from the adjacent country were assembling in considerable numbers for the defence of the post. Colonel Battersby in command of a demi-brigade of regular troops, stationed at York had also marched to its relief as soon as the destination of the American squadron had become apparent.

Next morning all the troops and marines with some sailors were landed and the British position on the heights was closely reconnoitered with the result that it was pronounced to be too strong to be carried by an assault. The re-embarkation took place the same afternoon. In the evening Chauncey weighed anchor and at three o'clock on the afternoon of the 31st appeared off the harbour of York. The ships remained outside while the schooners entered with the aid of sweeps and landed the troops who took possession of the town without resistance. At midnight they were again embarked after removing all the stores and provisions that could be found. Having obtained information that a quantity of valuable stores had been concealed some distance up the river Don, a landing was again made and boats sent up that stream to make a search. Some bateaux were found and carried off with several hundred barrels of provisions and some unserviceable cannon. The prisoners in the jail were liberated and the barracks, store-houses and woodyard set on fire. Battersby's force which had halted at midnight within eight miles of Burlington Heights, marched back as rapidly as the weary condition of the men would admit, but arrived several hours after the departure of the squadron which stood across the lake and cast anchor off the mouth of the Niagara on August 3. Here Chauncey remained for the next four days, landing the captured stores and making arrangements for another combined operation.

On the morning of July 31, having completed the equipment and refitting of his vessels, Yeo sailed from Kingston with a firm determination to seek a decisive action.

"As Sir James Yeo's disposition accords so fully with his instructions to burn, sink and destroy the enemy's squadron, I feel confident that a general action of a decisive nature must take place between the two fleets unless Commodore Chauncey's feelings differ widely from those of our Commodore," Prevost wrote sanguinely to de Rottenburg that day. "In the event the American squadron may seek refuge in the Niagara River, a circumstance which will bring you into communication with Sir James Yeo with whom you are cordially to co-operate in such measures for its destruction as may appear practicable, I transmit for your information a few signals Sir James Yeo wishes to have established in order to enable him to distinguish your posts on the lake shore from those occupied by the enemy."¹

He then knew that the American fleet of fourteen sail had been seen off Niagara on the 27th and off York on the 28th and 29th. Announcing the departure of Yeo's squadron, "powerfully armed completely manned, and ably commanded," in a letter to Earl Bathurst, Prevost said: "It is scarcely possible that a decisive naval action can be avoided, and I therefore humbly hope that His Royal Highness, the Prince Regent, will approve of its being courted by us, as a necessary measure for the preservation of the advanced positions of this army, which I have determined to maintain until the naval ascendancy on Lake Ontario is decided, convinced that a retrograde movement would eventually endanger the safety of a large proportion of the troops in Upper Canada and convert the heart of the Province into the seat of war."²

Yeo's squadron was then composed of two ships, the *Wolfe* and *Royal George*, two brigs, the *Melville* and *Moira*, and two schooners, the *Beresford* and *Sir Sidney Smith*. The *Wolfe* was armed with one long twenty-four pounder on a pivot, eight long eighteen pounders, four sixty-eight pounder carronades and ten thirty-two pounder carronades. She carried a crew of one hundred and seventy-five, exclusive of commissioned officers. The *Royal George* was armed with two long eighteen pounders on pivots, two sixty-eight pounder carronades and sixteen thirty-two pounder carronades. She was manned with a crew of one hundred and fifty-five petty officers and seamen. The *Melville* mounted two long eighteen pounders and twelve thirty-two pounder carronades and had a crew of sixty. The *Moira* carried two long nine pounders and fourteen twenty-four pounder carronades and a crew of ninety-two. The *Sidney Smith*, formerly the merchant schooner *Simcoe*, carried two long twelve pounders and ten thirty-two pounder carronades and a crew of eighty. The *Beresford*, formerly

¹ Prevost to de Rottenburg, July 31.

² Prevost to Bathurst, No. 61, August 1.

the *Prince Regent*, carried two long nine pounders, ten eighteen pounder carronades, and seventy men. In addition to these crews, two subalterns and ninety-six other ranks of the 100th Regiment and four subalterns and one hundred and twenty-six other ranks of the Royal Newfoundland Regiment to act as marines, were distributed on board in the following proportions, one officer and forty-eight other ranks of the 100th on the *Wolfe* and the same number on the *Royal George*; of the Royal Newfoundland, one officer and thirty-eight others on the *Melville*, one officer and thirty-four others on the *Moir*, one officer and twenty-two others on the *Sidney Smith*, and one officer and twenty-seven others on the *Beresford*. Just before sailing additional detachments of two sergeants and sixteen men of the Royal Scots and nine men of the 8th were taken on board the two ships.

The armament of the enemy's two ships and the brig had been accurately ascertained but there was considerable uncertainty as to that of the schooners which was liable to change from time to time. The addition of two guns on circles to the *Pike* was made just before sailing and came as a surprise. In calm weather and at long range Chauncey would have an enormous advantage. In long guns the American squadron was four times as strong as his own, while in carronades, his was twice as strong as his enemy. The *Pike* alone at a single broadside threw as much metal as all the American schooners and all her guns were long, entirely outranging those of the British ships. With a fair wind and a windward position she might be able to meet and beat his entire squadron. Under such circumstances the schooners were formidable adversaries, whereas in a gale or at close quarters they were nearly useless. All Yeo's vessels, except the *Sidney Smith*, were built for war and capable of acting together. They constituted a fairly good manoeuvring squadron. Chauncey's vessels manoeuvred badly as the duller sailers impeded the others, for they frequently had to be taken in tow to enable them to keep up. Yeo believed that success could only be attained by coming swiftly to close quarters when the smashing effect of his heavy carronades ought to be irresistible. The number of marines was consequently increased to enable him to carry any disabled vessels by boarding.

Calm weather varied by light breezes continued for almost a week and prevented him from reaching the head of the lake until August 6. He learned that the American squadron was still at anchor off Niagara. During the night he stood over in that direction in the hope of surprising and running close alongside the enemy at daybreak. Dawn came upon him while still ten miles distant and his approach was

discovered. Chauncey immediately got under sail and came within about four miles when he fired a broadside which fell much short and returned to his former anchorage.

Boyd had planned a joint attack upon the blockading force in the execution of which it was intended to embark a brigade of infantry on board the fleet that day and land it in rear of the British position near the mouth of the Twelve Mile Creek. This was necessarily abandoned. During the night Chauncey kept all hands at quarter and beat to windward in the hope of gaining the weather gage. After midnight a terrific squall struck his squadron and upset two of his largest schooners, the *Hamilton* of ten guns and the *Scourge* of nine, which were literally carried down by the weight of their own armament. Cries of distress were heard but the loss of these vessels was not confirmed until morning. Out of their combined crews, exceeding a hundred of all ranks, only sixteen were saved. Chauncey loosely declared that this accident gave his opponent a decided superiority, omitting to take into consideration the great concentration of force in the *Pike*. After daylight he edged away, as he explained in his official letter, to take advantage of the land breeze which usually sprang up in the course of the afternoon. During a calm his schooners swept out within distant range and opened fire with their long guns. At two o'clock a favouring breeze began to blow which enabled the British squadron to approach them quickly and they had considerable difficulty in hauling off to their anchorage just outside the bar at the mouth of the Niagara where they lay all night. One hundred and fifty additional regular soldiers were taken on and distributed among the larger vessels to assist in boarding or repelling boarders, increasing the total complement to about twelve hundred of all ranks. The *Lady of the Lake* was detached to Sackett's Harbour to bring up a further reinforcement of seamen and marines expected to arrive from the seaboard. It blew very hard during the night but Yeo still kept the lake. The *Royal George* had sprung a serious leak by which a large part of her powder was rendered worthless and now the *Melville* reported a leak. He still continued extremely sanguine of final success.

"The *Pike* is a very fine large ship," he wrote, "but appears to be very unwieldy and unmanageable, and from the manner she is worked, should judge she is not complete with seamen. The *Madison* is about the size of the *Wolfe*, sails well and is managed better than the *Pike*. The *Oneida* is small and sails bad, and the schooners, though formidable in a calm, are very contemptible otherwise, as they have not the least shelter for their men.

"My hope is that they may remain out at night when we may be able to close with them before they see us, and from their numbers they may be much dispersed.

"Procrastination is to us a great evil, as I never witnessed such enthusiasm as there is in every ship in the squadron. Your Excellency may rest assured that no opportunity shall be lost of bringing them to action."¹

For the next twenty-four hours the wind continued light and changeable. On the evening of the 10th the British squadron was becalmed off Twelve Mile Creek when Chauncey bore down toward it with a fine fresh breeze from the east. At sunset a breeze came off the land which suddenly gave Yeo the wind and he instantly made for his enemy, who then stood away with as much sail as his schooners could carry for the purpose of keeping up with his ships. He had formed his squadron in two lines abreast with his light schooners to windward and the heavy ones with the square-rigged vessels to leeward, each being a cable's length behind that in the lead. Those in the weather line were directed to open fire as soon as their shot would take effect and when the enemy came too close to bear away and pass through the intervals of the other line and again form line to leeward of it. This was an ingenious plan to entrap a heedless adversary and bring him under the formidable battery of Chauncey's flagship. At eleven o'clock firing began at long range but the American squadron was moving with such speed that more than an hour elapsed before the *Wolfe* succeeded in overhauling the windward line of schooners. All of them obeyed orders, bore up and passed to leeward except the *Julia* and *Growler* which were in the lead. These two hauled their wind and shot ahead to windward. Chauncey reported that he "filled the maintopsail and edged away two points to lead the enemy down, not only to engage him with more advantage but to lead him from the *Julia* and *Growler*." Yeo said that "on coming up with the *Madison* and *Pike* they put before the wind and made sail, firing their stern-chase guns." This is corroborated by a private letter from an officer of the *Madison*, published in a contemporary newspaper. "Every gun was pointed, every match ready in hand," he wrote, "and the red British ensign plainly to be descried by the light of the moon, when to our utter astonishment, the Commodore wore and stood south-east."

When this occurred, all the other vessels of the British squadron were from two to three miles astern of the *Wolfe*, which easily cut off and compelled the two schooners still remaining to windward to haul down their colours after sustaining some damage to masts and rigging from her fire. Yeo then concluded that it would be inadvisable to

¹ Yeo to Prevost, off York, August 9, 11.30 a.m.

² Letter in the United States Gazette of Philadelphia, Sept. 6, 1813.

pursue the remainder as his flagship was plainly the only ship that had the least chance of overtaking the enemy's vessels.

Next morning Chauncey ordered two of his dullest sailing schooners to anchor off Niagara under the protection of the batteries while the rest of his squadron ran into Genesee Bay and finding that the gale still continued, returned to Sackett's Harbour where he took in provisions for five weeks. On his way down the lake, he met the *Lady of the Lake*, coming to rejoin him with fifty marines.

"From what I have been able to discover of the movements of the enemy," he wrote, disconsolately, "he has no intention of engaging except when he can get decidedly the advantage of wind and weather, and as his vessels in squadron sail better than our squadron, he can always avoid unless I can gain the wind and have sufficient wind to bring him to action before dark. His object is evidently to harass me by night attacks by which means he thinks to cut off our small dull-sailing schooners in detail. Fortune has evidently favored him thus far. I hope it will be my turn next, and although inferior in point of force, I feel very confident of success."¹

On the other hand Yeo wrote almost at the same time:

"I feel confident that by watching every proper opportunity, we should get the better of him, but as long as he is determined to sacrifice everything to his own safety, I shall never in this narrow water be able to bring the two ships to action, as I have no vessel that sails sufficiently well to second me.

"This conduct he cannot persevere in long for his own honor as the loss of all his schooners, (which, I think, I must ever have in my power), will be an indelible disgrace, and I am at a loss to know how he will account to his government for it.

"It concerns me much to find that I have such a wary opponent as it harasses me beyond my strength. I am very unwell and I believe that nothing but the nature of the service keeps me up."²

Yet he had gained a real although unimportant advantage in a moral as well as in a material sense. To take two vessels from a superior fleet with his flagship alone, was, as Admiral Mahan remarks, a fine feat of seamanship. He had also discovered beyond doubt that prudence was his adversary's predominant quality. This is incontestably proven by Chauncey's instructions to Perry, written barely a month before. "The first object will be to destroy or cripple the enemy's fleet;" he wrote, "but in all attempts upon the fleet

¹ Chauncey to the Secretary of the Navy, August 13.

² Yeo to Prevost, August 11, 1813.

you ought to use great caution, for the loss of a single vessel may decide the fate of the campaign.”¹

Chauncey took the lake again on August 14 and two days later came in sight of the British squadron lying at anchor near the Bucks. Yeo immediately got under way and having a good wind, bore down to engage. Chauncey again wisely resolved to avoid an action under unfavourable conditions and made off under press of sail. On the 18th, the British squadron was seen apparently on its way to Kingston, and after sustaining considerable damage in a heavy gale, he returned to port on the following day.

In the meantime Yeo had run into Toronto Bay where he repaired and manned his prizes and then sailed for Kingston to take in supplies for an extended cruise. On arriving there one of his first measures was to send a flag of truce to Sackett's Harbour to gain information. By this means he learned that the whole of the enemy's squadron was then in port and he conjectured that it was not likely to come out until the new brig was ready. “I feel much disappointed at not being successful in bringing Chauncey to a general engagement,” he wrote, “I agree most fully with Your Excellency that until the enemy's naval force can be reduced, the ships cannot with prudence or safety co-operate with the land forces to any extent.....The commander of the *Lady of the Lake*, told our officer it was policy their not engaging us.”²

The new vessel at Sackett's Harbour was launched on August 18, and named the *Sylph*. Although designed as a brig she was rigged as a schooner. Great efforts were made to complete and equip her with the utmost speed, as Chauncey believed that he would then have a considerable superiority. From her design she was expected to sail very fast and more than counterbalance his losses. This vessel was afloat in twenty-one working days after her keel was laid. Although designed to carry twenty-four guns, she was temporarily armed with four long thirty-two pounders mounted on circles between masts and eight long six pounders in broadside. It was expected that fire from these heavy long guns might dismast some of the enemy's vessels and thus render them helpless in a general action. Another similar vessel, Chauncey declared, would enable him to dispense with all his dull-sailing schooners, which in a high wind had proved of little service on the open lake. He had then received the disquieting information that the construction of three new corvettes had been contracted for at Kingston under the conditions that one should be launched every forty days reckoning from the 3rd of August. Two

¹ Chauncey to Perry, July 14.

² Yeo to Prevost, August 22; Baynes to Prevost, August 19.

flags of truce were sent over in rapid succession to obtain information and the last of these reported that the whole of the British squadron had left port.

Yeo had sailed on the 23rd for Burlington Bay with guns and a small party of seamen whose services were urgently needed on Lake Erie taking under convoy several small transports loaded with supplies for the troops in the western part of the province. A combined attack on the American positions near the mouth of the Niagara had been contemplated but delayed to await the arrival of siege guns and howitzers. These had been shipped from Montreal but were delayed by a report that several small hostile craft were lurking among the Thousand Islands. The commandant at Prescott was in consequence ordered to make a thorough search for them.

"I wrote to Lt. Colonel Pearson by express informing him that in a memorandum of instruction you had left with me on your departure," Colonel Baynes reported to the Governor-General who had gone to Niagara to supervise this important operation, "that the utmost vigilance and exertion should be preserved to secure the communication between Prescott and Kingston from insult and interruption; that it appeared to me an object of the first importance that these pirates should be dislodged with as little delay as possible and their intended depredations by that means counteracted, that a force could not be spared from this place for that service as the armed sloop and only gunboat fit for service were on the point of sailing to convoy two small vessels with stores to the head of the lake, which could not be delayed as their cargoes were much wanted above and the only remaining gunboat was under repair but would be ready Tuesday evening and that all the disposable force of this garrison was held in readiness for an ulterior movement which could not be interfered with. I therefore recommended his availing himself of the detachment of the 100th Regt. under Major Taylor and of the seamen of H.M.S. *Dover* with all the Indians he could collect as well as militia volunteers and such further reinforcement from the garrison of Prescott as he might deem necessary to complete a detachment with his five gunboats capable of rooting out and destroying this nest of robbers; that so favorable an occurrence as the junction of the 100th and the seamen could not again be speedily looked for; that it was necessary these reinforcements, particularly the seamen, should be sent forward with the least possible delay; that nevertheless, I felt confident Your Excellency would approve of their detention for *a short period*, if *thereby* so important an object as the destruction or capture of the enemy's flotilla could be achieved."¹

¹ Baynes to Prevost, Kingston, August 16.

Pearson spent three days in making a thorough examination of the creeks and islands but was unable to discover any traces of an enemy. On the other hand his expedition caused at least a delay of a week in forwarding artillery and reinforcements.¹

A reconnoissance in force of the American entrenched camp at Fort George convinced Prevost that it would be unwise to attempt an assault without the aid of heavy guns and it was deemed advisable to postpone any attack until the contest for the command of the lake had been decided.

"To procrastinate the decision of naval superiority on the lake seems to be the policy which governs the conduct of the naval and military commanders of the United States forces in this quarter, Prevost wrote, "but, unless they mean by it ultimately to sacrifice their army at Fort George, exposed as it will be in the absence of their squadron, to a joint operation against it by our land and naval strength, an action on the lake, must, I think, ere long be unavoidable, as it was determined when Sir James last sailed to force the enemy to one tho' under the guns of their forts."²

The American commanders held very similar views. "Chauncey will go out, he says, to-morrow or next day to seek Sir James," Wilkinson said in an official letter, "I see the necessity of settling the point of *naval superiority* before we commit ourselves and therefore the decision cannot be had too soon. . . . I fear Yeo will avoid a contest to spin out the campaign and gain time for reinforcements and the organisation of the militia, but if he will not come out we must blockade him."³

The British squadron failed to get clear of the Ducks until August 25 and did not reach Burlington Bay until the 27th. The guns and seamen for Lake Erie were landed there and Yeo sailed immediately for the mouth of the Twelve Mile Creek where a much needed supply of stores for the Centre Division was put on shore. He continued to cruise in that part of the lake and on the last day of the month captured a schooner and several bateaux loaded with supplies for Fort Niagara. Returning thence to the head of the lake and taking the empty transports under convoy, he arrived off York on the morning of the 4th September when the American squadron was seen in the direction of Niagara. Crossing the lake in the course of the afternoon nine vessels were observed to enter the river and join three already there. Two Irishmen who had recently deserted from the garrison of Fort George were sent on board his flagship when it came to anchor off

¹ Pearson to Baynes, Gananoqui, August 22.

² Prevost to Bathurst, St. Davids, Niagara Frontier, No. 88, August 25.

³ Wilkinson to the Secretary of War, Sackett's Harbour, August 26.

Twelve Mile Creek to give him the latest information. These men were responsible for a false report, which seems to have been current in their camp, that Chauncey had been placed under arrest and superseded in his command by Commodore Hull.

"The deserters say they are beating up for volunteers," Yeo wrote, "I have no objection to their taking every man at Fort George, the more the better. I have very little doubt that a new commander will produce new measures, and that as soon as he comes, we shall have a general action, which, as I consider it the first and great object, I shall remain in this quarter, (as long as my provisions last), to watch their motions and give countenance to the Centre Division."¹

After his arrival Chauncey increased the armament of the *Sylph* by exchanging some of her light guns for others of larger calibre and took on board about two hundred soldiers as marines. His presence in the river placed the blockading force in a position of much peril and uncertainty.

"Sir James will continue here," de Rottenburg informed Prevost, "and it will rest with Your Excellency, should the enemy not be inclined to come out, whether he is to remain for the protection of the army under my command or proceed to Kingston for the purpose of escorting supplies. This manoeuvre of the enemy places me in a dilemma, for should the fleet leave me, I cannot possibly hold this position long while so powerful a fleet is in the river which may at any time come out and act in my rear."²

Early on the morning of September 7, the British squadron was lying close into the mouth of the river when a fresh breeze sprang up from the southward giving Chauncey the opportunity for which he had been waiting so patiently. He got under way at once but Yeo then made sail northward intending to avoid an action and draw his adversary into the lake when a sudden change of wind might give him the weather gage and enable him to come quickly to close quarters. For the next four days the opposing squadrons continued to manoeuvre for most of the time within sight of the forts and investing force and usually from four to eight miles apart, endeavouring to gain or keep the weather gage, without firing a shot. They were constantly watched by thousands of anxious eyes as the fate of both armies seemed then to depend on the result of an action which was thought to be inevitable. The prevalence of light winds and calms gave Chauncey a decided advantage which was, however, counter-balanced by the necessity of taking his dull-sailing schooners in tow

¹ Harvey to Yeo, Sept. 4; depositions of William Quin and Francis Brown; Yeo to Prevost, Sept. 5.

² De Rottenburg to Prevost, Four Mile Creek, Sept. 6.

by the square-rigged vessels to enable them to keep together. Early on the morning of the 9th, the British squadron returned to the mouth of the river and captured a small schooner under the fire of the batteries. None of the American vessels were then in sight but the whole squadron soon re-appeared and both lay becalmed off Four Mile Creek until evening. At twilight on the 10th a breeze rose and they disappeared from view in the darkness, going down the lake under press of sail. About noon the next day off the mouth of the Genesee River Chauncey succeeded in approaching within effective range of his long guns and opened fire carefully maintaining his distance.

"On the 11th instant, the enemy's fleet having a partial air succeeded in getting within range of their 24 pdrs." Yeo wrote, "and from their having the wind of us and the dull sailing of the *Moir*, I found it impossible to bring him to close action, and we remained in this mortifying situation five hours, having only *six* guns in all the squadron that would reach the enemy, (not a carronade was fired). When a breeze sprung up I came under these islands as the enemy could not keep the weather gage but be obliged to give us an opportunity of closing with him. This he most carefully avoids, and nothing I have been able to do as yet can induce him to come down. They are now to windward of the islands and I am watching any opportunity that may offer of bringing them to action.

"I cannot but consider (it) as fortunate that the squadron have not received any material damage, which must have been considerable, had the enemy acted with the least spirit and taken advantage of the superiority of position they possessed."¹

He reported the loss of Midshipman Ellery and three seamen killed and seven seamen wounded.

Chauncey's official letter naturally put a different aspect on this engagement.

"Off Genesee River," he said, "we carried a breeze with us while he lay becalmed to within about $\frac{3}{4}$ of a mile of him when he took the breeze and we had a running fight of three and a half hours, but by his superior sailing he escaped me and ran into Amherst Bay yesterday morning. . . . I was much disappointed that Sir James refused to fight me, as he was so much superior in point of force, both in guns and men, having upwards of twenty guns more than we have and heaves a greater weight of shot. I think his object is to gain time to add to his force and play a sure game, or as the boisterous season is approaching, he may wish to defer an action until he meets on the Lake when it is blowing heavy and to leeward of him, when my small

¹ Yeo to Prevost, H.M.S. *Wolfe*, off the False Ducks, Sept. 14; Yeo to Warren, Sept. 12.

vessels would be of no service and he might succeed in cutting some of them off."¹

Yeo has been censured somewhat inconsiderately by a recent writer for not having substituted some of his long guns for carronades and thus remedied the disparity of force to some extent. Had this been practicable and expedient it is scarcely probable that so experienced a seaman would have failed to resort to such an obvious device.

As Amherst Bay was little known to his pilots and reported to be full of shoals, Chauncey prudently declined to enter it but remained in observation until informed that Yeo had gone off to Kingston by another channel when a heavy gale forced him to take shelter in his own port. The sound of the prolonged cannonade in Genesee Bay had been heard distinctly at Sackett's Harbour where the Secretary of War had arrived several days before for the purpose of supervising the concentration of troops there for a movement upon Kingston and ultimately Montreal. "The battle on the lake," he wrote, "shall we have one? If Yeo fights and is beaten all will be well. If he does not fight the result may also be favorable."²

Immediately on his arrival in port Chauncey was directed to sail to Niagara and protect the troops coming from that quarter in their passage down the lake. He carried with him a letter to Wilkinson in which the Secretary of War said: "Are 8,000 men competent to seize and hold a point on the St. Lawrence, which shall have the effect of severing Sir George's line of communication? If a point be so seized will not, must not, Prevost press on to dislodge it with his whole force? He must, and what then? Kingston and the fleet and the new ship are abandoned. Other three thousand may pass the lake and demolish him."³

Sailing on the 18th, Chauncey discovered the British squadron near the False Ducks next day but proceeded up the lake without paying any attention to it, in the hope of drawing it in pursuit. Head winds prevented him from arriving off Niagara before the 24th.

Prevost had become much alarmed at the critical position in which both the Right and Centre Divisions of troops in Upper Canada had been placed by the temporary ascendency obtained on Lakes Erie and Ontario by the enemy.

"It is evidently the policy of the American commanders to protract the final decision of the naval superiority from an expectation of depriving me of the means of forwarding those supplies which are requisite to the troops in advance to enable them to maintain their

¹ Chauncey to the Secretary of the Navy, Sept. 13.

² Armstrong to Wilkinson, Sackett's Harbour, Sept. 6.

³ Armstrong to Wilkinson, Brownsville, Sept. 15.

present position, which, it is well known, the state of the country will only allow to be transported to them by water."¹

He urged Yeo in the strongest terms to despatch seamen to Lake Erie and forward supplies to York and Burlington.

Finding that his prize schooners from their dull-sailing were only an encumbrance whenever the enemy had the weather gage, Yeo sent them into Kingston to have their heavy guns transferred to the *Beresford* and remained outside the harbour for several days waiting for a favourable wind. "This unusual calm weather cannot last many days at this advanced season of the year," he wrote, "All our pilots declare that they never remember such extraordinary continuation of calms."² He assured the Governor-General that the squadron would be ready to perform any service deemed necessary for the transportation of men and stores but asked that such a request should be put into writing as without a written communication on the subject he did not feel justified in losing sight of the enemy's squadron.

He was furnished in consequence with written instructions in which Prevost remarked:

"The Centre Division of the Upper Canada Army is placed in a situation very critical and one novel in the system of war, that of investing a force vastly superior in numbers within a strongly entrenched position. It was adopted and has been maintained from a confident expectation that with the squadron under your command a combined attack ere this could have been effected on the enemy at Fort George with every prospect of success. To the local disadvantage of the position occupied by our army have been added disease and desertion to a degree calling for an immediate remedy. You are therefore required to proceed with the fleet under your command with the least possible delay to the head of the lake, affording sufficient convoy to the small vessels containing those stores and supplies of which the army is in the most pressing want. Upon your arrival near the headquarters of the Centre Division you will consult with Major-General de Rottenburg, who will unite in his person the civil and military commands in Upper Canada upon my withdrawing from the Province, upon the eligibility of a combined attack for the purpose of dislodging the enemy from Fort George by a rapid forward movement of the army, bringing up in battery at the same time the heavy ordnance, mortars, and howitzers now embarked. This attack must be supported by the countenance of your squadron and the fire of such vessels as are armed with a description of ordnance favourable to it. Should this attempt appear to you to be attended with too great

¹ Prevost to Yeo, Sept. 14.

² Yeo to Prevost, Mouth of the Bay of Cante, Sept. 15.

hazard to the squadron under the possible circumstances of the enemy appearing on the lake, you will in that case distinctly state your sentiments to Major-General de Rottenburg, who will immediately upon your ascertaining your inability to assist him, take measures for evacuating the position he now occupies, in the execution of which movement you will give his army every support and assistance consistent with the safety of your vessels, and having performed this service, you will pursue such measures as will appear most probable to ensure the acquisition of the naval ascendancy."¹

Yeo sailed the same day, keeping close to the north shore to avoid discovery while his vessels were encumbered with siege guns and bulky stores. He landed these at Burlington without mishap on the 25th and ran into Toronto Bay next day. There he was discovered by the *Lady of the Lake* sent over from Niagara to reconnoitre. The American squadron got under way immediately on her return but did not succeed in getting clear of the river until late in the evening and during the night the vessels became much dispersed. After they reassembled in the morning, the *Pike*, *Madison*, and *Sylph* each took a large schooner in tow and the entire fleet, of eleven sail, steered toward York. When they came in sight Yeo made sail and stood out of the bay. The wind blew strong from the south-east giving Chauncey the weather gage. He bore down to engage in a long extended line under press of sail. At noon when the opposing ships were nearly within distant range, Yeo's six vessels tacked in succession with the evident intention of closing with the centre of the hostile line and cutting off the schooners in rear. As soon as the *Wolfe* which led this movement came abeam the *Pike*, the American vessels wore in succession and firing began; the *Wolfe* engaging the *Pike* with the schooner *Asp* which she had in tow and the schooner *Governor Tompkins* until the *Royal George* came to her support. The *Governor Tompkins* soon lost her foremast and fell astern. The *Madison* and *Sylph* failed to come up as neither of them saw fit to drop the schooners they had in tow. At the end of twenty minutes, the *Wolfe* had lost her main and mizzen top-masts and main yard. Being thus deprived of all her after sail, there was no other alternative than to keep before the wind which was fair for Burlington Bay and the protection of the batteries on the heights. All sail was made at once on her foremast in the effort to get away. As she ran to leeward the *Royal George* luffed up across her stern, "delivering her broadsides in a manner to extort exclamations of delight from the American fleet."² The *Pike* immediately hauled off and took up a distance out of cannonade range

¹ Prevost to Yeo, Kingston, Sept. 19.

² Cooper, History of the Navy of the United States of America, II, 433.

where her long twenty-four pounders would be effective. Every gun that would bear was turned upon the *Royal George*. The entire British squadron made for the shelter of Burlington Heights where Yeo hoped to resume the action on more favourable terms if pursued closely. Considerable time was lost in picking up the schooners which had been cast loose but Chauncey eventually kept up the chase until three o'clock when his ship was within six miles of the head of the lake. A strong wind was then blowing from the east making a rough sea accompanied with every sign of a storm.

"I considered that if I chased the enemy to his anchorage at the head of the lake, I should be obliged to anchor also, and although we might succeed in driving him ashore, the probability was that we might go ashore also," Chauncey wrote, "he, amongst his friends, and we, amongst our enemies, and after the gale abated, if he could succeed in getting off one or two vessels out of the two fleets, it would give him as completely the command of the lake as if he had twenty vessels. Moreover, he was covered at his anchorage by part of his army and several small batteries thrown up for the purpose. Therefore, if we could have rode out the gale we would have been cut up by their shot from the shore. Under all these circumstances and taking into view the consequences resulting from the loss of our superiority on the lake at this time I, without hesitation, relinquished the opportunity of acquiring individual reputation at the expense of my country.¹

In this running fight lasting three hours, which became known in the British squadron by the name of the *Burlington Races*, the *Pike* had received considerable damage, having her maintopgallant mast shot away, her fore and main masts badly wounded, rigging and sails much cut up. Several round shot penetrated her hull between wind and water and the holes could not be plugged from the outside owing to the high sea then running. Twenty-seven of her crew were killed or wounded, the majority by the bursting of a gun which tore up her forecastle. Several other guns cracked at the muzzle and could not be used without danger. The *Madison* received some round shot in her sides but had not a man hurt. The *Governor Tompkins* lost her foremast and the *Oneida* had her maintopmast badly wounded.

On the other hand Yeo reported:

"I have deeply to lament the loss of our masts, otherwise in a quarter of an hour we should have brought them to close action, but I can assure you, Sir, that the great advantage the enemy have over us from their long twenty-four pounders almost precludes the

¹ Chauncey to the Secretary of the Navy, Oct. 1.

possibility of success, unless we can force them to close action, which they have ever avoided with the most studied circumspection."¹

Five men were killed and thirteen wounded on his squadron which, with the exception of the *Wolfe*, had suffered little injury. A battery was hastily constructed and armed for its protection. Immediate steps were taken to refit the flagship. During the night the gale grew more violent and next morning eight of the American vessels were seen off York lighthouse struggling to make the mouth of the Niagara near which they came to anchor that night.

Next day Chauncey landed to confer with General Wilkinson. The naval engagement had been watched by many eager eyes from the heights of Lewiston and Queenston as well as from the ramparts of the forts. The masts of the *Wolfe* were plainly seen to fall overboard and the *Royal George* was observed to bear down to her assistance and fire three broadsides in quick succession. The firing was heard to continue for some time after both squadrons had passed out of sight leaving the spectators in a state of anxious suspense.

Wilkinson wrote the next day:

"The issue must therefore have been decisive, because the breeze freshened without any change in its direction, and the narrowness of the lake made it impossible for the vanquished party to escape by any manoeuvre.

"I have no doubt the victory is ours, but am apprehensive it must have cost us dear, since the batteries of the enemy were superior to those of our squadron, and the British commander is an officer not only of desperate resolution but of great naval skill."²

The movement of the bulk of his force from Niagara to Sackett's Harbour began in open boats on the morning of September 28 but the strength of the gale forced them to return. When the wind fell, another start was made on the 1st of October and most of the boats succeeded in reaching Eighteen Mile Creek.

In a memorandum addressed to Chauncey that day, Wilkinson said:

"The main body of the division of the army at this point has sailed to join that at Sackett's Harbour at the head of the St. Lawrence with the design to reduce Kingston and Prescott and to proceed against Montreal.

"The main body of the enemy's force is in this vicinity, at the head of the lake, and in York, leaving Kingston very weak.

"The enemy's squadron, beaten and forced to the head of the lake, is not in a position to attempt the regaining of Kingston harbor while the American squadron keeps an eye upon it.

¹ Yeo to Prevost, Sept. 29.

² Wilkinson to the Secretary of War, Fort George, Sept. 29.

"Under these circumstances will it be for the interests of the service that the American squadron should accompany the flotilla with the troops or shall it watch the British squadron, effect its destruction and prevent the sudden transport of the division of the enemy by a rapid movement by water to reinforce Kingston ?

"It strikes me that in the first case, the enemy, being apprised of our intentions, which cannot be concealed, may, with the aid of their squadron, reach Kingston before our troops are embodied and organized for the attack, and thus the reduction of the place may be spun out to the consumption of the season, and of course the main design must fail.

"In the second case while the American squadron blocks up that of the enemy at the head of the lake, the flotilla will enjoy a free sea and the British by being cut off from transport by water will be thrown back a month in their arrival at Kingston, long before which period the place must be taken and our army landed on Montreal island, no act of God intervening to thwart our intentions."¹

In reply, Chauncey contented himself by remarking:

"The reasons you assign in your memorandum why the American squadron should remain in this vicinity in preference to accompanying the flotilla down the lake are so conclusive and correspond so exactly with my own ideas and wishes upon the subject that I have no others to offer. I will barely observe that my best exertions shall be used to keep the enemy in check in this part of the lake or effect his destruction, yet with my utmost exertions and greatest vigilance, he may, (when favoured by a strong westerly wind), slip past me in the night and get eighteen or twenty hours the start of me down the lake before I can discover his movement. If that should be the case I shall lose no time in following with so much celerity as to prevent his interrupting you in your operation against Kingston."²

Wilkinson's intentions were, however, partially disclosed to de Rottenburg by statements of deserters as early as September 28 and he sent off a message in post haste to warn the commandant at Kingston of the impending attack. "My ulterior movements must now depend on the issue of this action," he said, "I am prepared to meet disaster with fortitude and assure Your Excellency that any retrograde movement I may be compelled to make shall be done deliberately and without precipitation."³

Two days later he had received further information from other deserters that all the enemy's troops of the line, except a single regi-

¹ Memorandum from Wilkinson for Chauncey, Fort George, Oct. 1.

² Chauncey to Wilkinson, off Niagara, Oct. 1.

³ De Rottenburg to Prevost, Four Mile Creek, Sept. 28.

ment were under orders to proceed to Sackett's Harbour for the purpose of attacking Kingston. Two flank companies of de Watteville's regiment which had just arrived at York were in consequence ordered to return to Kingston and arrangements made for removing many of his sick and wounded to the same place by the transports. An officer who came in from Burlington that day reported that all damage to the squadron had been repaired. "The enemy's squadron had the wind all yesterday and to-day but never presumed to molest our fleet," he wrote. "What this can mean I am at a loss to account for, except that it blew very hard and they were afraid of coming on a lee shore. The American squadron is now off our coast here, apparently endeavoring to get into the River Niagara. The *Madison* seems to have lost her maintop gallant mast and one of the schooners her topmasts. I trust we shall see Sir James to-morrow, as there is every appearance of the wind changing in his favor."¹

On October 2, he knew that the movement of troops toward Sackett's Harbour was well under way and he decided to despatch a strong detachment of three battalions to Kingston in bateaux at once and go there himself to take command. "I had a communication with Sir James yesterday," he wrote. "The damages sustained by his squadron have all been repaired and he is now fully determined, for the sake of saving Kingston, to perish with his whole fleet or destroy that of the enemy."²

The opposing squadrons came in sight again that morning off Niagara but as Chauncey succeeded in getting the wind, Yeo stood away toward Burlington. At sundown he was off the Twenty Mile Creek and came to anchor for the night as the breeze was light and variable. Next day the wind rose and blew in gusts from the south and south-west and Yeo ran toward the head of the lake, increasing his distance until sunset. The night was very dark with occasional squalls of rain and he shaped his course for Kingston, passing his adversary quite unseen, and arriving there on the 6th.

The morning of the 4th was hazy and Chauncey continued working up toward Burlington Bay. The *Lady of the Lake* was sent in advance to reconnoitre and late in the evening reported that none of the enemy's squadron were to be discovered at the head of the lake. All sail was then made in the direction of the Ducks for the protection of the boats transporting troops toward Sackett's Harbour. The wind blowing steadily from the north-west, increased to a gale, and a speedy run was made. In the afternoon of the 5th, seven sail of schooners and sloops were discovered near the False Ducks. The

¹ De Rottenburg to Prevost, Four Mile Creek, Sept. 30.

² De Rottenburg to Prevost, Four Mile Creek, Oct. 3.

Pike, *Sylph*, and *Lady of the Lake*, cast off the schooners they had in tow and gave chase to these vessels which were the transports from York with two companies of de Watteville's regiment and many sick and wounded on board. The sloop, *Betsey*, sailing badly, was set on fire by her crew and abandoned. At sunset when off the Ducks, the schooners *Hamilton*, (formerly the *Growler*), *Confiance*, (formerly the *Julia*), and the sloop *Mary Ann* were overtaken by the *Pike* and surrendered. The sloop *Drummond* was taken soon after by the *Sylph*. The sloop *Lady Gore* ran in to the Ducks where she was captured next morning. Only the sloop *Enterprise* succeeded in making her escape into Kingston with thirty grenadiers on board.¹ Chauncey anchored with his prizes in Sackett's Harbour on the 6th. Lieut. Colonel Drummond with the troops from Niagara arrived at Kingston on the 8th, making that place tolerably secure. Wilkinson had arrived at Sackett's Harbour on the 4th and immediately "remonstrated freely and warmly" with the Secretary of War against making an attack upon Kingston. Subsequently he presented his objections in writing, the principal one being that "the chief object of the campaign, the capture of Montreal, will be utterly defeated and our own army subjected to great difficulties, losses and perils."

The Secretary firmly overruled him saying: "The only safe decision, therefore, is that if the British fleet shall not escape Commodore Chauncey and get into Kingston Harbour, if the garrison of that place be not largely reinforced, and if the weather be such as will allow us to navigate the lake securely, Kingston shall be our first object, otherwise we shall go directly to Montreal."²

On the 9th, Wilkinson informed Chauncey that he intended moving against Kingston next day and asked his co-operation which was readily promised. He then asked him to state whether he could agree to keep Yeo in check so as to ensure a safe landing for troops above or below Kingston and in the event that project was abandoned whether he could guarantee a safe passage for them down the St. Lawrence as far as his ships could go.³

Yeo had anchored his squadron in Collin's Bay for the double purpose of opposing a landing above Kingston, should that be attempted and having his ships in readiness to descend the channel if that became necessary. Lieut. Charles Anthony, an officer of much experience, who had served as first lieutenant in the flagship of Sir Richard Strachan, was appointed to command the flotilla of gunboats in the

¹ Chauncey to the Secretary of the Navy, Oct. 6 and 8; Major-General Darroch to Prevost, Kingston, Oct. 6.

² Memorandum dated Sackett's Harbour, Oct. 5.

³ Wilkinson to Chauncey, Oct. 9; Chauncey to Wilkinson, Oct. 9.

St. Lawrence, which was now considered a post of great importance. On October 11, one of these gunboats, commanded by Lieut. Lamont of the Royal Scots, having indiscreetly effected a landing at Gravelly Point, was surprised and taken by a party of riflemen lying in ambush.¹

The Governor-General had already sanctioned the construction of a corvette to carry twenty-eight guns and a brig to carry twenty. In consequence of Yeo's urgent recommendation the brig was altered to a ship of the same dimensions as the other, for he declared that any number of brigs would not be of the least service when opposed to ships armed with heavy guns. Casualties had then reduced the number of seamen who had accompanied him from England to three hundred and ten effectives. Five officers and fifty seamen from the troop ship *Dover* and about an equal number of volunteers from transports lying in the river at Quebec had since joined him. The volunteers had been recently ordered to return to their ships. To replace them, four officers and one hundred and ten men, drafted from the Marlborough, were sent on from Halifax by Admiral Griffith in the sloop *Indian*, which was laid up at Quebec and a detachment from her crew also despatched to Kingston, making in all a party of six officers and 145 seamen. On inspection Yeo was greatly disappointed. "There are Americans who have been taken this war, a number of old, infirm men and boys," he wrote, "and in short as improper a set of men for the service they were selected for as could have been pitched upon. I have therefore been under the necessity of taking out of the ships our good men for the gunboats and replacing them with this rabble."²

To demonstrate his inferiority to his opponent he submitted a comparative statement of the force of the squadrons on Lake Ontario, showing that he had six vessels, armed with nineteen long guns, throwing 330 pounds of shot, and seventy-two carronades, throwing 2,312 pounds of shot, and manned by 688 seamen to oppose eleven vessels, armed with sixty-one long guns, throwing 1,337 pounds of shot, and fifty carronades, throwing 1,124 pounds of shot and manned by 1,360 men.³

A recent letter from the Governor-General having indicated some disposition to censure his conduct, evoked a modest remonstrance from Yeo to which Prevost replied:

"I cannot too strongly impress upon you that it is necessary for the salvation of Upper Canada that a hearty and cordial co-operation should exist on all occasions between the army and navy.

¹ Memorandum by Lamont, Oct. 11.

² Yeo to Prevost, Oct. 11.

³ Memorandum, Oct. 8.

"It has been my constant study since my arrival to cultivate a good and perfect understanding between the two services in order that the honor and advantage of our country might be promoted by their joint exertions. Your appeal therefore appears to be unnecessary and I have no desire to censure your conduct. My only complaint is that you do not view as I could wish you to do the consequences of leaving in critical positions our troops exposed to the joint operations of the American fleet and army, thereby exposing them to disgrace and a precipitate retreat. To prevent a measure of that nature which might greatly affect the honor of our arms and the safety of our country, something should be hazarded and the consequences which would result to the army from the want of your support should equally weigh with you with that which might follow from any attempt to prevent the joint co-operation of the enemy's land and sea forces."¹

Four days later Prevost wrote to him:

"The precautionary measures which you appear to have taken in conjunction with Major-General Darroch for the security of Kingston will, I think, prove sufficient to deter the enemy from attacking that place at the present moment, but as the large force now collected at Sackett's Harbour cannot be kept a day inactive whilst so short a period remains for carrying on offensive operations, it is possible General Wilkinson may look to more vulnerable points and attempt forcing his way to Montreal by the St. Lawrence while General Hampton penetrates into Lower Canada by the Chateauguay River, or else attempt carrying Prescott by a *coup-de-main*. In short any movement the enemy may attempt in the narrow waters will afford you a good opportunity of using your vessels and gunboats to the greatest advantage and enable you to defeat and distress either of these operations beyond measure. I am glad to find you will have established a good lookout on the enemy's motions in Sackett's Harbour and I hope you are well prepared to avail yourself of any favorable opportunity which may offer for the destruction of the small craft and bateaux they may have collected."²

Before these instructions were received, General de Rottenburg had arrived at Kingston and assumed command. He directed Yeo to proceed at once to the head of the lake to assist the Centre Division in its retreat, sending the schooner *Vincent* and all the gunboats to the eastern end of Wolfe Island to oppose the passage of the American flotilla into the St. Lawrence. The squadron accordingly sailed at daylight on October 15 with a fair wind which, however, changed before the harbour was cleared and obliged it to return. A flag of

¹ Prevost to Yeo, Montreal, Oct. 6.

² Prevost to Yeo, Montreal, Oct. 12.

truce came back the same day from Sackett's Harbour with information that that port was thronged with bateaux and other small craft and the American seamen said that Kingston would certainly be their next point of attack. The officer in charge reported that a new brig had been added to the American squadron which he had seen with her topmasts up and apparently ready for sea. This intelligence induced Yeo to station his ships for the defence of Kingston while he detached all the smaller vessels under Mulcaster to join the gunboats off Wolfe Island.

Chauncey got under way on October 16, with instructions to bring down another body of troops from the mouth of the Genesee. Before he cleared the harbour these orders were cancelled and he was required to protect the movement of troops from Sackett's Harbour to Grenadier Island for which purpose he took up a station off the Ducks. There he remained for ten days occasionally cruising to and from Grenadier Island, keeping a close watch upon both channels leading into Kingston and running in so close at times as to obtain a view of the port and alarm the garrison. The weather during this time was very stormy and his ships were several times driven from their anchorage. Many of boats transporting troops and stores were driven ashore or wrecked. Heavy rain fell daily frequently turning to snow. "This weather is of itself almost sufficient to defeat the enemy," Captain O'Connor wrote from Kingston on October 27.

Chauncey's movements were wholly successful in mystifying the British commanders. On October 17, Yeo wrote from Kingston to the Governor-General:

"I perceive your anxiety that every effort should be made by the squadron to stop and defeat the enemy's flotilla in going down the St. Lawrence. I have, therefore, (as the only alternative left to accomplish that object), ordered such parts of the squadron as can act in the river down to the east end of Long or Wolfe Island until all the gunboats can be collected from Prescott as that narrow channel properly blockaded will in my opinion leave the navigation as safe as the gunboats with the convoy, that is for a few days until we can be assured of the enemy's real intentions, for if they go down the river it will be necessary to have all the gunboats collected and ready to follow them. I have consulted every pilot as to the practicability of the two ships being of any use in the narrow waters and they all agree that they can go down the river to Prescott with a fair wind but that there is not room to manoeuvre or work them in the narrow channel. I therefore do not like to risk them unless the enemy's squadron go down, in which case they are all ready to follow or to do their utmost

in repelling the enemy in an attack on this place. It is with the utmost reluctance I divide the squadron, and nothing but Your Excellency's pointed instructions on that head could have induced me to do it as I have a strong presentiment that Kingston is the place they will attack, particularly if they hear we have divided our force or they will take advantage of it and go up to York. These being my sentiments I request Your Excellency will explicitly make known to me your opinion as to the disposition I have made that any other arrangements may be made without delay."¹

Prevost's reply restored his full liberty of action.

"I by no means intended to prevent the free exercise of your own judgment in making such a disposition of the squadron as under all circumstances you might, on consultation with Gen'l de Rottenburg, think most advisable. I am therefore perfectly satisfied with the reasons you have given for keeping the fleet together and have the fullest confidence in your making that further disposition of it as will best promote the object, I trust, we all have in view, a successful resistance to every attempt of the enemy."²

In conclusion he expressed strong doubts whether the enemy actually intended to make an attack upon either Kingston or Montreal.

Between the 18th and 25th of October the whole of the American troops destined to take part in the expedition were concentrated upon Grenadier Island where they were organized into brigades and divisions. On the 25th General Wilkinson arrived and the movement by detachments began at French Creek, nearly opposite the proposed point of landing below Kingston, which had been selected for the final rendezvous. This was reported next day by de Rottenburg to Prevost who wrote cheerfully in reply:

"I almost covet the opportunity you are likely to have of displaying your talents. By good example and personal encouragement you will obtain from every one a zealous discharge of their respective duties I hope our squadron will deal death and destruction throughout their armada as it approaches Kingston and the gunboat division prove unsparing to those who are to attempt Gananoqui."³

On November 1, Captain Mulcaster with the brigs *Melville* and *Moir* and four gunboats, joined the schooners *Sir Sidney Smith* and *Beresford* which had been cruising for some days near the lower ends of Wolfe Island. Snow was falling so thickly that it was scarcely possible to see any distance until late in the forenoon. When a move-

¹ Yeo to Prevost, H. M. S. *Wolfe* at Kingston, Oct. 17.

² Prevost to Yeo, Montreal, Oct. 21.

³ Prevost to de Rottenburg, Oct. 29. (In cypher).

ment at length became practicable, Mulcaster made sail for French Creek. A detachment of riflemen posted on a high bluff near the mouth of the creek was driven off and fire opened upon the camp which was briskly returned by some field guns. This action was continued until it grew so dark that the American position, which was to some extent sheltered by thick woods, could no longer be distinctly seen. The vessels then drew off for the night having received several round shot in their sides, none of which did any material damage. During the night the wind rose and prevented the gunboats from renewing the attack as had been contemplated. At break of day the brigs and schooners again ran in when it was found that a battery armed with three long eighteen pounders and a furnace for heating shot had been constructed. Several hot shot struck them and they soon discontinued the fight, having lost one seaman killed and an officer and four seamen wounded. The American commander reported a loss of only ten men killed and wounded. One small schooner was driven ashore.¹

On October 29, Chauncey had visited Wilkinson on Grenadier Island and learned with great surprise and discontent that he had abandoned all intention of co-operating in an attack upon Kingston if, indeed, he had ever seriously entertained it.

"I was much disappointed and mortified to find that the General had taken his determination to descend the St. Lawrence and attack Montreal in preference to Kingston; disappointed because in all consultations upon this subject for the last four weeks, Kingston was fixed upon as the point to be first attacked, and when I parted with the Secretary of War on the 16th, I understood that it was his decided opinion that Kingston should be first reduced; mortified to find that the navy had been used as a mere attendant upon the army for the purpose of transport and protection, and when it could no longer be used for those purposes and the season too far advanced to cruise on the lake with safety, it is left to protect itself in the best manner it can without the possibility of participating in any enterprise against the enemy this season.....It exposes the fleet and stores to certain and total destruction the ensuing winter; for if the enemy collects the whole of his force from the different points of the upper province at Kingston, he will have, from the best information, between four and five thousand regular soldiers; with this force he can, (after the first of January), cross on the ice to Sackett's Harbour in one day, burn the fleet and town, and return to Kingston without difficulty; in fact, I should not be astonished if Sir James should take

¹ Mulcaster to Yeo, Nov. 2; Major-General Jacob Brown to Colonel Dennis French Creek, Nov. 2.

advantage of a westerly wind while I am down the St. Lawrence and run over to the harbour and burn it, which he certainly can do if he knows its defenceless condition; for to the best of my knowledge there are no troops left there except sick and invalids, nor is there more than three guns mounted."¹

Still he declared that he was willing to give the troops every assistance in the way of transport and protection, and that he would escort the flotilla down the river until beyond all danger from molestation by the British squadron but stated explicitly that he deemed it unsafe to remain in the St. Lawrence after the first week in November on account of ice.

His squadron entered the river on November 2 and on the following day anchored off the lower end of Wolfe Island in the northern channel. The British squadron soon made its appearance and anchored in the southern channel near Sir John's Island about five miles distant. The sound of its bells could be distinctly heard and the guard boats fired at one another several times during the night. The passage between was too shallow to allow them to cross without danger of running aground and they remained watching each other. Wilkinson arrived with his rear guard at French Creek but he was too ill to exercise any personal command. Next day he informed Chauncey of his decision to begin the descent of the river on the 5th with the intention of running past the batteries at Prescott during the night; if that proved impracticable he would land and assault them. This operation might occupy several days and he asked protection until it was accomplished. Chauncey replied that he was in a position to watch both channels but did not consider it safe to detach any portion of his squadron as he was in hourly expectation of being attacked.

"I will remain in my present station until you pass Prescott," he added, "but am anxious for that event to take place at as early a day as possible, as the fleet cannot move out of this river except with a fair wind. It is to be apprehended that after a few days a spell of westwardly winds will set in which may detain us until the ice makes, which would endanger the safety of the fleet and probably lead to its destruction."²

At the same time he had some fears for the security of transports left without protection at Grenadier Island and thought it possible that troops with artillery might be landed from Kingston upon Carleton Island, which would render his return into the lake extremely difficult. He soon after changed his anchorage to the vicinity of that island, where he remained until the evening of the 9th. He then took

¹ Chauncey to the Secretary of the Navy, No. 101, off Stony Island, Oct. 30.

² Chauncey to Wilkinson, Nov. 4.

up a station off Gravelly Point which he kept until the appearance of the sky induced him to run for shelter to Sackett's Harbour, where he arrived on the morning of the 11th, barely in time to escape a heavy gale from the west accompanied by snow.¹

Urgent orders were then received from the Secretary of War directing him to supply transportation for a brigade of infantry from Niagara to Sackett's Harbour for the protection of that port, which had been nearly denuded of its garrison and was presumed to be in some danger of attack. Sailing thence with a fair wind he arrived off Niagara on the evening of the 14th and sent all his squadron except his flagship into the river to facilitate the embarkation of troops and stores. This was accomplished before night on the 16th and the whole got away on the return voyage. The wind soon increased to a gale blowing strong from the east with heavy rain and snow. The squadron was dispersed and driven toward the head of the lake. Most of the schooners made for the mouth of the river again. One got in safely, another carried away her rudder in crossing the bar, a third was driven ashore and some of her crew perished. Others were tossed about at the mercy of the waves and fired guns of distress all night. The *Julia* succeeded in coming to anchor close to the entrance of Burlington Bay where she succeeded in riding out the storm. Large fires were kept burning near the forts for the guidance of the pilots. The *Madison* and *Oneida* ran for shelter toward Toronto Bay but to their surprise found the entrance strongly fortified and beat back to the mouth of the Niagara where they arrived on the morning of the 20th. Several seamen had been swept overboard and lost but the vessels sustained little injury. At midnight the wind suddenly changed to westward and the *Pike* and *Sylph* ran at once for Sackett's Harbour arriving there on the evening of the 30th. Next day the *Oneida* and four of the schooners which had taken refuge in the Niagara came in.

"The troops and seamen suffered extremely," Chauncey wrote, "as they were wet from the commencement of the gale until their arrival here. The water was so deep on the berth deck that we were obliged to scuttle it to let the water off, yet the men arrived in better health than could have been expected."²

The smaller vessels were immediately laid up and arrangements made for quartering the seamen on shore. The army had then gone into winter quarters and all expectations of an advance upon Montreal apparently abandoned.

¹ Chauncey to the Secretary of the Navy, Nov. 11.

² John F. Bacon to Governor Tompkins, Fort George, Nov. 21; Chauncey to the Secretary of the Navy, Sackett's Harbour, Nov. 21.

"It will become absolutely necessary," Chauncey wrote, "to increase our naval force upon this lake, so as to be ready to meet the enemy upon equal terms in the spring. I have positive information from Kingston, from a person who left there Sunday last, that the enemy have two vessels with all their ribs up and in a state for planking. One of these vessels is said to be 150 feet keel; the other about 123. They have the materials for a third in a state of preparation. Situated as our army is at present they cannot prevent the enemy from sending from Montreal to Kingston all the ordnance and stores that will be required to fit these vessels for service and no doubt they will profit by the opportunity."¹

Yeo took advantage of Chauncey's departure from his station off Wolfe Island to send all his gunboats under Captain Mulcaster, escorting a division of bateaux with a body of picked troops from Kingston, in pursuit of the American flotilla descending the St. Lawrence. These gunboats rendered effective service by menacing and harassing the rear guard of the expedition. Two American schooners were scuttled and abandoned by their crews to avoid capture. Parties of troops were landed at Ogdensburg and Hamilton who brought off two heavy guns and quantities of provisions and stores left behind at those places. During the action at Chrysler's Farm the gunboats protected and supported the right flank of Colonel Morrison's force with their fire. Mulcaster afterwards descended the river to Coteau du Lac and opened communication with the division of gunboats stationed in Lake St. Francis. He continued to observe the American position on Salmon River until winter set in.

The construction of two frigates and several gunboats at Kingston was carried on with great activity by Yeo and O'Connor during the two last months of the year. Early in December Yeo despatched Scott, his first lieutenant, by the toilsome overland route to Halifax to inform Sir John Warren of his exact situation.

"The two new ships are in a very forward state," Yeo said, "and I am almost certain of having a force in the spring, sufficiently strong to meet the enemy with effect and decision. I need not point out to you, Sir, the great advantages that are to be hoped for by this squadron being on the lake three weeks or a month before the enemy. This, I think, is certain if I receive a reinforcement of seamen by the beginning of April and not otherwise, and I know of no other possible means of obtaining them but by their marching to Quebec. Lieut. Scott is well qualified to conduct, having travelled that road before.

¹ Chauncey to the Secretary of the Navy, Nov. 25.

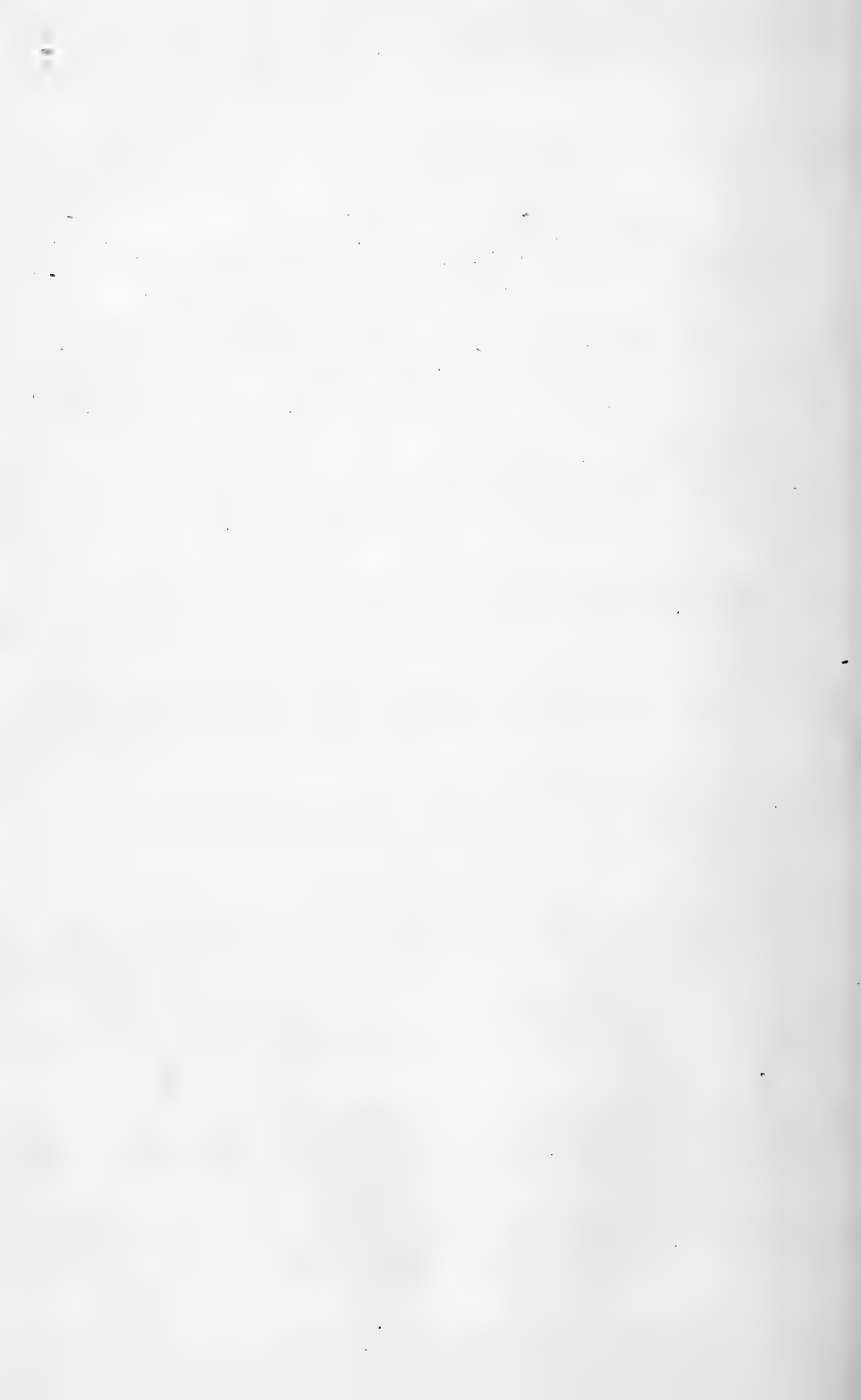
"I trust whatever men are sent from Halifax may be selected for this particular service for I have not the power of keeping up that strict discipline and subordination which I could do on the Atlantic. I, therefore, must depend much on the good disposition of the seamen. The *Marlboro's* have been guilty of every extravagance and given more trouble than all the establishment put together. There were also several blacks and American citizens among them, the latter of which I, of course, immediately discharged.

"From the unavoidable exposure of the service in the gunboats at this season of the year, we have a great number sick, (nearly eighty), I therefore am certain, (to ensure success), we shall require 200 or 250 additional seamen."¹

He had then received reliable information that sixty-eight shipwrights had recently been added to the navy yard at Sackett's Harbour to be employed in the construction of two forty-four gun frigates and that Chauncey had gone to Washington to confer with the Secretary of the Navy on his future operations.

Calgary, May 2, 1916.

¹ Yeo to Warren, Kingston, Dec. 6, 1813.



Thucydides and History.

By MAURICE HUTTON, M.A., LL.D., F.R.S.C.

(Read May Meeting, 1916.)

That the personality of an historian is a large factor in his history is the merest truism: if only because in history, as in metaphysics, there is no such thing as the fact in itself: *ding an sich*: but all so called facts are strained through the moulds furnished by the special nature of the writer.

But this subjective element will vary immensely in direct ratio to two forces, not identical though converging: to the depth and force of the writer's personality but also to the theory which he holds of his function as historian.

Theories of history, like theories of life itself, will modify largely the play of temperament and personality. No man was temperamentally gayer or lighter hearted than Matthew Arnold: his theory of life nevertheless went a long way to diminish the gaiety and high spirits of his writings.

There are broadly two theories of history. There is the large and chiefly modern school of historians, who almost seek to turn history into a record similar to the records of the investigations of the naturalist or mathematician. History is to record facts ascertained by severe and laborious research into the original authorities. It is to be documented by reference to these authorities. It is to turn largely on the constitutional development and constitutional changes in a nation's life: on its economic changes: on the influence of geography and climate. In short, it is to be an unfolding of law, law human as unfolded in constitutions and institutions, and law natural as illustrated in economic, geographic and climatic forces. It is to fight shy of the merely personal factors in life: the characters of individual men and women: partly because these are of less importance in a broad view of life, but even more because these are past finding out. The influence of moral and religious ideas in the same way must be left without treatment for the same reasons that these things are of little importance apart from economic, geographic and climatic forces, and that in any case they are too subjective for discussion. They seem to raise the thorny question of free will in man. History had better adopt, as a working hypothesis at least, the doctrine of necessity, and assume that, so far as the historian is concerned,

his work is to be a record only of the results of law: like the records of the naturalist and mathematician: and that the virtues and vices of men are equally the results of law, of conditions and environment, and are not affected by the metaphysical figment called free-will.

If a man holds such a theory, as many do, it is obvious that even a marked and vivacious personality will not obtrude itself into his history: that his history will become almost impersonal on principle: that though the writer be a Bishop, it may be, his history will not be a hand book of morals, a collection of inspiring anecdotes, a fountain of moral edification: that it will not improve the occasion, as the phrase is. For all such efforts, the writer will turn to such other functions as he may be in a position to discharge, the functions of a Bishop, or a schoolmaster, or a father, and the like.

Bishop Stubbs, for example, was a man of marked personality, of caustic humour and masculine good sense, intolerant only of trivialities, of humbug and affectation and waste of time. But we know this from sources other than his histories: and if he was a voracious reader of fiction as well as a voracious historian we are entitled to surmise that it was because he found history, as he conceived it and made it, so dull, that he turned instinctively to the opposite field of literature for relief and refreshment. If he had held a less dry theory of history he would have written better history and have read fewer novels: both his writing and his reading would have gained.

The historian of to-day, says another academic historian, Lord Acton, dines in the kitchen: if he does so, he does so of his own will and judgment and no one else need complain: if *he* does not. But it is a different matter that he should make his readers dine there with him. After all, it is usual for the cook who prepares the entertainment in the kitchen to take her own entertainment there: it is not usual for her to ask the guests to join her at her repast.

I trust I am not flippant beyond measure. Quite seriously, it does not really and rightly follow that, because history involves a lot of dull spade work and heavy research, the result, when served up, should be also dull and heavy. Goldwin Smith was not. Gibbon was not: he avoided it by footnotes. We may suppose that he was always learned: that he read Thucydides amid the diversions of the nursery: but his learning sits lightly on him and the easy reading which he furnishes is the best tribute he desired to the hardness of his work.

There is, however, and always has been a conception of history diametrically the opposite of that which imposed itself upon Bishop Stubbs: the conception that the historian is also or almost a poet. A true historian will give his imagination free play in the interpretation of the difficult and bygone minutiae of time and place and nationality,

and will lift them up into the atmosphere which is familiar to himself and his readers, and will make modern history of them, and will re-write them in short for his own age and in the language of his own age, and in so doing will, in a sense, universalize them, in spite of certain obvious risks in so doing. Shelley said that every good historian was a poet. Carlyle illustrated Shelley's contentions in his history of the French Revolution. Froude illustrated it in a less degree in his histories, and has been alternately exalted and depreciated since by students of history according as they follow Shelley's or Aristotle's conception of the function of the historian. (Aristotle said that history was the antithesis of poetry, that poetry was more serious and more philosophic.)

If after this preamble we turn to the historians of Greece, the same antithesis even there presents itself in germ at least, if not highly developed.

Herodotus is frankly expansive, personal, imaginative. He desires to produce a certain general effect, and to produce this effect it is as nothing to him if some of his details be obviously imagined, be manifestly devoid of evidence. He is willing that it should be so. He is willing that any reader of his shall say "And now I know all and more than all that is known of this or that great man": provided that the reader can add with some confidence "but not more than the angels know", that is, provided that the added and imaginary details furnished by Herodotus from his inner consciousness are true in spirit to the details actually known: provided that they are *ben trovato* and furnish suitable diet for the intellectual repast of angels and other beings who live in the spirit.

Nay more, Herodotus does not conceive that truth, even when conceived in this broad sense, is his only or his primary object. No: he is called upon rather to chronicle belief and word, fancy and conversation, superstition or scandal, anything and everything which occupies man's thoughts, rather than the historical facts, if any, beneath the words and fancies or scandals. He is not required to believe everything, nay anything that he has heard, but he is required to chronicle it.

But Herodotus redeems his dangerous theory by his choice of his anecdotes, scandals, superstitions: if there are a few stories introduced only because they are macabre, grotesque, or gruesome, if occasionally Herodotus suggests a modern "realist", that is a writer of matter so exceptionally nasty as hardly to be real in a broad sense any longer, still on the whole he selects his anecdotes—however unauthentic—for their serious inner truth, for their profound moral significance. It is for this reason that he has become a storehouse for

the moral and anecdotal historian who is more concerned with human nature than with constitutions or economics. Men have been inspired to take up classics for their vocation by Rollin's history: but Rollin was first inspired by Herodotus. We do not learn from him, we have to wait for twenty centuries to learn from Mr. Leaf, that the Trojan War was akin in spirit to the Gallipoli campaign of 1915, that it was a battle for the economic control of the waterways of the Black Sea and the Aegæan and of the grain trade which issues through those waterways. But his own special and picturesque theory of the cause of the Trojan War and of other great wars between East and West, though it wholly overlooks the play of economic forces, cannot be said to overlook the play of other true causes, and other real forces in human history, underlying life in all ages and modifying it here, there and everywhere, and far more likely to-day to be under-rated and under-stated than exaggerated: *cherchez la femme* is no mere flippancy or cynicism as an explanation of events, and is not antiquated and out-of-date because our historians have learned also to take more account to-day, of the impersonal and less picturesque factor of economics.

When we turn from Herodotus to Thucydides we are already opening the preface of the volume of scientific history: we are passing from the expansive and personal historian who parades—like Byron—before his readers the pageant of his heart and mind, to the reserve and the silence and the *mauvaise honte* of the modern scientific historian, of the man who counts it beneath him, or above him, to have moral judgments, who counts it still more unworthy of his functions to write emotionally, whose good taste or *mauvaise honte* rejects as egotism all reference to himself, whose æsthetic sense or *mauvaise honte* leaves his story always to speak for itself and suggest its own morals.

I was speaking of the doctrine of necessity which underlies the work of the scientific historian. It certainly underlies the work of Thucydides. He assumes in one of the best known passages of his introduction (Book I. 22) that human nature is the same in all ages, that—as Aristotle puts it—*πάντα σχεδόν εὑρηται*—"pretty well everything is known" which is to be known; and that accordingly the history of the future will follow the lines of the past as similar conditions geographical, climatic and economic recur. His book will therefore be no mere picture of local and ephemeral conditions—to which Aristotle condemns the historian—but like the work of the poet, a book of reference for all times and lands.

If his work is not as baldly scientific and dry as that of his modern admirers, it is only because even with him as with Herodotus, the dra-

matic element still lingers, and his history, like the history of Herodotus, seems still in part modelled on tragedy. As Herodotus, in effect, retains a chorus to strike the note of the impartial spectator and comment suitably on the tragic history of men, some Croesus or Artabanus who lingers on in the history, after his own part is over, to point the moral, (as Margaret of Anjou lingers on in Shakespeare's plays) so even Thucydides seems to entertain the doctrine of the Divine Irony as set forth by the Athenian dramatists, and presents the hour of triumph and of paeans as the hour preceding downfall: the insolent exultation of Athens over Melos, the arrogance of the Athenians at the Melian dialogue becomes a sort of Bacchic chorus, ushering in the fatal Sicilian expedition with its motive of "world empire or downfall", even as the triumphant Bacchic chorus of Sophocles' *Antigone* heralds the suicide of *Antigone* *Haemon* and *Eurydice*.

And in a few other passages—notably at the end of the third book in the Ambraciot episode—there is a dramatic and artistic value wholly foreign to severely scientific history. But these poetic touches are the rare exceptions which relieve at long intervals, the impersonal and colourless narrative: scarcely even when the events narrated are most appalling and appealing will the writer let it be seen that the appeal has reached himself. When the brutal Thracian mercenaries of Athens—the Albanians or Bulgarians of Thucydidean Thrace—break into an elementary school of bucolic Boeotian children and murder all the pretty babes [or heavy babes] at one fell swoop, faint and far seems the echo of the humanitarian sentiment of the sentimental Athenians which we can catch in the comments of their very unsentimental and academic historian. It is no jest but sober truth which Professor Mahaffy expresses when he remarks that Thucydides' emotion is discernible here only in the extra contortions and crabbedness of his syntax. (VII. 29.)

This is a crucial instance of that *mauvaise honte* of the scientific historian which banishes emotion and indignation from his pages, and which regards expansiveness as the unpardonable sin in history.

Herodotus breaks out to record his personal dissent from the mild and abstract proposition of some contemporary Darwin that man is only an animal and need not be more careful of his behaviour in temples and holy places than animals are seen to be. "The proposition is displeasing to me" he tells us: Thucydides will not let his personal disgust be seen even when infants are butchered. It seems to be beneath the dignity of history: to be an unworthy concession to popular feeling and superficial sentiment, to be a playing to the gallery and the groundlings.

But note however how this *mauvaise honte* and this reserve defeats itself in a sense and debars the historian—scientific though he may be—who is its victim, from discharging one of the chief functions of history. It is the merest commonplace that history should record not only wars and battles and royalties and constitutions, but the general life of the people themselves, social, industrial, artistic, moral and religious, and this quite apart from the modern or democratic conditions, which give more or less to the mass of the people the control of their governments, and therefore give the people of necessity a place in history.

Even under autocratic governments, such as those of the East in Herodotus' time, and since, we expect that the historian shall not confine himself to the doings and sayings of royalty, but shall describe the life of their subjects. This is what Herodotus has done, and though he might fairly and scientifically have argued that history *was* made in those days by kings and generals and that therefore their deeds and words were of the essence of history, he has yet gone far outside them and has described everything he saw and heard discussed: the customs, beliefs, even the dress and food of the ordinary man: the servants he kept or did not keep, the ornaments the women wore, the uses to which they put them: the soil and climate: the yield of different cereals and fruits: the physical structure of the land and of its inhabitants: the flora and fauna: the life-history of great rivers and their effect on geography: the sources of the Nile, the circumnavigation of Africa and so on. He is an encyclopaedist, and an encyclopaedist all the more useful because he writes with verve and enthusiasm and is brimming over with a sense of the importance of his function as a reporter.

The scientific historian Thucydides, on the other hand, is debarred by *mauvaise honte*, by his unfortunate sense of the dignity and impartiality or even neutrality—that most abused of all words—the neutrality even, which he thinks incumbent on the historian. He is not to report frivolities and trivialities, he is not to become a tattler and a gossip *ἀνθρωπολόγος*: he is not to descend to personalities: he is not to mention women: he is not to describe the petty local and picturesque occasions which serve as the odorous sulphur match to light great conflagrations; the occasion, for example, of the revolt of Mytilene from Athens. He is to confine himself to the great conflagration—the revolt itself. All else is unnecessary and superfluous and supererogatory. He is not even to mention the names of speakers, when speeches are recorded. The speech is to show the great lines of thought, which animated peoples during the Peloponnesian War—the lines of thought will be blurred or at least reduced to insignificance,

if the speaker's name be obtruded: a merely personal note will seem to detract from their larger import.

Life is full of trifles but art of dignity, and the trifles of life—though they be also its tragedy and comedy—are unworthy a place in the history, which is to go down to posterity for a book of perpetual reference: and therefore though the Peloponnesian War touched Greece closely on every side and affected every one and every thing, Thucydides has not condescended to give much more than its military operations and its broader diplomatic history. Only three continuous chapters have been given to its moral effects (one of them accounted spurious): apart from his account of the plague, the military and diplomatic history have been relieved only by those strange speeches so curiously blent of scientific and unscientific elements: unscientific, since they are frankly not Hansard reports or anything approaching them; ultra-scientific, since they exclude all the personal note and all topical allusions, and leave only a skeleton or outline of political or national principles—very eloquent sometimes, as in the Funeral Speech, and very instructive, as in the speech of Cleon, but much more natural in the reflections of a philosophic historian, than on the lips of a popular orator. It is hard to believe that the real Pericles was not more topical, it is impossible to believe that Cleon was not. Lord Bryce the other day in a service in honour of Mr. William Gladstone referred to the loss of young life in this war, and quoted from the Funeral Speech of Pericles "the year has lost its spring". Now the words are not in Thucydides' version of that speech and perhaps he thought them "tosh"; perhaps he just forgot them: in either case it was Aristotle who had sufficient sympathy with poetry to treasure up from the Funeral Speech this little touch of the poet: (Aristotle's *Rhetoric* Bk 1. 7. 34) none the less poetic even if it was not original exactly on the lips of Pericles but a quotation from Gelo [Herodotus VII. 162] much improved by a nobler application.

Thucydides could have enlightened us in a million ways about the daily life of Greece, the outer and the inner life, and have shown us the soul of its peoples. He has put aside the task as unworthy of a severe and scientific thinker, has left it wholly on the shoulders of Herodotus and Plutarch, and only rarely—very rarely—has let us see that any personal opinions or emotions were evoked in him by the course of the war.

This is high art it may be said: the highest art: the historian lets his facts speak for themselves and thereby enables them to speak with tenfold force. Thucydides has so successfully concealed himself that no one ever suspected personal bias even in his account of

Cleon, until the democratic enthusiasm of Grote on behalf of demagogues, threw a light into dark places and cast a shadow on the seeming impersonality of the historian's history. The defence may be an adequate defence of the silence of Thucydides on moral themes, of his comparative silence about the "frightfulness" of Athenian policy or the "frightfulness" of the war generally: I think it is: but where the facts do not speak for themselves, where they need interpretation, it is a dead loss to the modern reader that Thucydides either records facts without explanation, as, for example, the mutilation of the Hermae, or does not think them worthy of record at all.

If Herodotus or Plutarch had covered the same ground with the same advantages, what a different place the Athens of Pericles and Socrates would be for us to-day! How infinitely more real and more alive! Plato and Aristophanes have done something to fill the gap but neither can be expected to fill it well: and each is justified, and even compelled, by his special subject matter to leave it largely unfilled. We had a right to expect from Thucydides as an historian records which cannot be required of dialogues on philosophy and still less from the frank caricatures of ancient comedy: and least of all from the conventional and, so to speak, Sunday-school sermons and religious services of ancient tragedy.

After all this generalising and all this more or less vague beating of the air in which Thucydides moved, let me come down closer to details and endeavour to seize a few points of his mind—unseized it may be by the Germans yet—and publish them before this Society.

It appears to me that perhaps the most curiously salient or crucial passage for plumbing the depths of Thucydides' personality is that in book VII—(VII. 86) which records his judgment on the career and character of Nicias. It is an extraordinary verdict. Here is a general, who has been condemned already in the history, at least by implication, for lack of vigour: who has been condemned explicitly for superstition (*θεισμός* VII. 50): whose unscrupulous politics in the matter of Pylos, where he risked defeat for Athens for the sake of discrediting a rival, have been frankly stated: whose selfishness in remaining in Sicily rather than face complaints and recriminations at home, obviously sacrificed Athenian to personal interests and was afterwards emphatically contrasted for this reason by Plutarch the moralist with the unselfish patriotism of a much more obscure general, one Leo of Byzantium: whose craving for life even at the bitter end, when everything else but life was lost, has been recorded without comment: and yet after all these materials furnished us for a verdict more or less unfavourable to Nicias, the historian concludes:

This or something of the sort was the cause of his execution: of all Hellenes of my time he had least deserved a fate so unhappy: when his practice of every customary virtue is taken into account.

The historian's verdict throws more light on his own temperament and point of view than on the peculiar hardships of Nicias' fate. Why was this conventional, wealthy, reputable and hitherto lucky Athenian general held up for special commiseration? Grote has argued that his repute testifies to the inner conservatism of the Athenian people, who chose this typical conservative to lead them. But why did Thucydides also choose him for a special tribute of pity?

I can only suggest that the historian, himself an "intellectual", as the phrase goes in France, a member of the "aufklärung", as they say in Germany, one of the "illuminati" as the Italians have it, had arrived very positively at this conclusion from the use of his intellect and his illumination, that intellect and illumination are a very dubious advantage to their owner and his countrymen—from the political point of view: that after all that man is the best citizen who sticks to the old paths and does not see beyond them; that those laws are best, which are the laws of one's own country; and that that religion is truest which is the religion of one's own country—the answer which the oracle of Delphi by the way also once had given to an over-speculative enquirer after absolute truth:—and therefore his praise of Nicias.

It is not an unfamiliar point of view of course. It finds support from Aristotle when he comes to eulogise the same Nicias and to criticise the reformer and idealist Hippodamus of Miletus. There is a brilliant array of Frenchmen of our own days, who similarly exalt on general grounds a conservatism and an orthodoxy which some of them can hardly be supposed to augment with their personal convictions; which most of them perhaps endorse with their judgment rather than with their private emotions, Barrès, Bazin, Brunetiere, Bordeaux, Bourget, Bergson: but I do not know that a stranger and stronger instance of this conservatism of experience and judgment can be found than the eulogy of Thucydides—the disillusioned historian—pronounced over the pietist, traditionalist and in every sense commonplace character of Nicias. It suggests that to Thucydides' mind the ultimate truth of politics is that "dullness with honesty"—average honesty at any rate, "is better for a state than cleverness with recklessness; cleverness without balance." The words are the words of Cleon (III. 57).

And that aphorism leads one to the very curious and piquant difficulties which surround the relations of Thucydides and Cleon.

The aphorism is one of Cleon's: it belongs to his speech on the Mytilenaeen question as reported by Thucydides himself (3. 37). The whole of the speech is along similar lines: a plea for common sense and practical prudence in dealing with enemies as against newfangled ideas of humanitarianism, or as against philosophic idealism or as against mere ingenious sophistry. The speech is extremely powerful as an indictment of Athenian humanitarianism, idealism, ingenuity and sophistry. It seems to me to be the best speech—I had almost said the best passage—in Thucydides, with the possible exception of the Funeral Speech. But that only makes it doubly difficult to gauge the relations of the speaker and the reporter of the speech. How comes it that Thucydides has reported so vigorous an expression of what we may call Tory-democracy, an expression by a democrat of the old Tory creed of horse-sense and common instinct and natural nationalism against fads, ideals and 'ologies of every kind? and has supported it by an emphatic tribute to Nicias, the incarnation of old conventions (though not of democracy) and yet has no word of commendation for the speaker, but on the contrary has taken away his character with posterity? And all the more successfully and artistically because with so much self restraint, that no one before Grote suspected prejudice and unfairness and a personal grudge.

No one supposes that Thucydides' speeches are close reports of their originals: all the more difficult is it to understand the real force and eloquence of Cleon as reported. And there is a further contradiction and mystification in this matter. Thucydides writes or reports, or writes partly and partly reports, Cleon's protest against Athenian many-sidedness and susceptibility, Athenian idealism and scepticism; Cleon's trenchant conclusion that democracy is an impossible form of government for the conduct of foreign politics (for foreign politics must have continuity and principle, and democracy is the government of fits and starts, of snap votes and see-saw emotions) Thucydides goes out of his way—as though in order to supplement Cleon—to exalt the humdrum moderation of Nicias, and yet—*per contra*—he implicitly and explicitly condemns Cleon as a violent demagogue, despite the large element of Toryism common to Cleon with Nicias. Further, in his famous chapters of reflection (Bk. III, 82-83) Thucydides laments the ill repute and unpopularity which by reason of the war came to be attached to academic thinkers, to the enlightened and the scrupulous and the best educated men in Athens. Owing to the war—he says—moderation came to be regarded as a mere excuse for cowardice and to know everything—people began to say—was to do nothing.

Is not this "trying to have it both ways"? Who was it who said "to know everything was to do nothing"? Not merely the Athenian public, if we may read between the lines, but the historian himself also. What can his fantastic praise of Nicias mean, except that to his own mind also as well as to the popular mind, there seemed no help for the city from its best educated and most intelligent people, and more help from the stolid conservatism and stubborn unintelligence of Nicias? And what does the brilliant speech of Cleon mean except the same thing? And if Thucydides feels the force of Cleon's speech and the force of Nicias' timid orthodoxy and of his blind obedience to customary virtues, why should he complain that the most intelligent and best educated were forced to the wall? On his own showing that was the only place for them. They were incompetent to help the State in a crisis. They had no beliefs or habits or sheet-anchors left and in the storm of the war sheet anchors were beyond all things necessary: and the man who had one—even a Nicias—was the best citizen of the State: and the man who deprecated high flown novelties and far-fetched sensibilities—even a Cleon—was a good citizen.

I have tried to penetrate the ideas underlying this strange eulogy of Nicias. I have assumed that the tie uniting two men so different as Nicias and Thucydides was the political conservatism of each. I have assumed further that they represent between them the two schools of thought into which conservatism has ever been, still is, and perhaps will continue to be divided: the conservatism of unthinking loyalty to the past, conventionalism, traditionalism, or even mere class and economic interests: and, on the other hand, the conservatism of profound scepticism and doubt: doubt which reaches so far that it accepts the established always just because it is established; and feels that any change may be for the worse, and no change in politics can be demonstrated to be for the better, since politics is not yet a science, and since even beneficent changes open the door to unsettlement and discontent, and break down that sense of finality and settled order on which the contentment and therefore the happiness of a State depends.

Sir Walter Scott, to take an illustration from our own history, or a greater man, Edmund Burke, represent more or less the romantic conservatism of the first kind. Gibbon, Hookham Frere, Canning, Mansel and all the Saturday Reviewers represent the conservatism of the doubters. Aristotle has given voice to the two spirits of conservatism: one in his chapter on Hippodamus and one in his eulogy of Nicias. Thucydides has anticipated Aristotle in expressing them.

I assume yet further that the conservatism of Thucydides has led him to give vivid and vital expression to that glorification of selfish commonsense and rough nationalism or national egotism which we

find in Cleon's argument: to that depreciation of scruples and humanitarian sympathies which we find in Cleon's arraignment of Athenian susceptibility: but that, this vein of sympathy with Cleon's speech by no means prevents him from heartily disliking and distrusting the speaker. He sympathizes with him as a Tory and dislikes him as a democrat and a man. The sympathy is merely intellectual and never personal. The dislike is profound and personal: a dislike of taste and feeling. There is no agreement between him and Cleon except in opinions. Thucydides was divided like other men between his judgment and his personal tastes, like the great Lord Falkland, for example; his friends were all among the educated and the refined and sensitive: his judgment was against his friends, at any rate in politics, as too sensitive and scrupulous and undecided for the rough business of politics. His taste and judgment met together again and were reconciled when he encountered the personality of Nicias, a man of the upper class, "a gentleman" as we say, and yet an unhesitating and confirmed conservative: hence the extravagant praise of Nicias and the very mixed verdict and uncertain sound with which Thucydides expresses himself on the cultivated and refined members of his own circle: the men who knew everything and did nothing. When he coined that epigram I cannot but think that to him it expressed something more than a democratic scoff, a Cleonic scoff, at mugwumps and kidglove politicians and independents. It expressed something of a serious truth. These academic thinkers were not of the stuff of statesmen: were too many sided and undecided: independents are people who cannot be depended upon: professors and philosophers are the worst of statesmen: they think they can arrange the world with essays and lectures. They make bad Presidents.

Whatever else we can read between the lines of his history is consistent with these assumptions and explanations. It is pretty obvious that Thucydides had a great admiration for Pericles. It is not from him but from Plutarch that we hear that Pericles was like other great reformers; that he had to begin by playing to the gallery, if by so doing he could advertise himself and get a following, and prepare the way for serious and conservative reforms later on. Thucydides admits no such opportunism. Pericles is with him the ideal reformer who aimed at conciliating all opposites and making Athens the union of all conflicting virtues: the seat of liberty, yet the home of law and lawful authority: the temple of art, yet the city of severe simplicity and economy: and most of all, the very fountain of free thought, free speech, free life and philosophy, and yet the nursing mother of soldiers, sailors and men of action: a sort of Platonic Callipolis reconciling and embracing the opposite virtues of Athens and

of Sparta: that Sparta to which Thucydides with Plato and all the Athenian intellectuals—even Socrates—so fondly turned amid the noise and blather, the babbling and bubbling, the blabbering and blubbering of Athenian democracy.

It is not from Thucydides that we hear that the Periclean ideal was impracticable. He certainly implies that it failed; but he does not put the blame on Pericles for its failure. He seems to suggest that it did not fail as long as Pericles was present to inspire his countrymen with his ideals. Periclean Athens to Thucydides is Athens at her best. Periclean Athens was nominally a democracy—he writes—in reality she was a city governed by her first man (II. 65).

This is perhaps a sort of Carlylean or Ruskinese hero-worship; it is certainly not the expression of a Lincoln-democrat. Government for the people was Pericles' aim. Government by the people was hardly even Pericles' practice, so far as we can judge. And it was certainly not Thucydides' idea of good government. There is, or was, a Society of St. Michael, I believe, to which Ruskin and Carlyle belonged at least in spirit: a society intended to protest that in politics as in religion a man best shows his free will by surrendering it freely to the grace given him from above, from a God or a god-like man, to whose will he submits himself: after that it is not he who works but the grace, the will of the higher nature, which works in him. Obedience—a free and willing obedience to such grace—is his salvation. Thucydides, I think, belonged to the same school: the very antithesis of the modern and characteristic school of the Socialists. "Enough of great men" is *their* cry: "nous en avons assez." "Do not think of me, do not magnify me" said Francisco Ferrer, a genuine and sincere martyr to this cause. "The future does not depend on individuals but on classes and communities: the individual is henceforth nothing. He has had his day and ceased to be."

I turn from Thucydides' politics to his religion. A man's religion, says Carlyle, is the most interesting thing about him. It may be so, but it is not on that account the most easily discoverable. Herodotus' religion is both interesting and discoverable: the old doctrine of Divine Jealousy pushed to its logical conclusion, illustrated with fantastic modern instances but relieved by the other Herodotean doctrine—the complement of jealousy—of Divine Compensation: the same God who puts down the mighty from their seat is careful to exalt the humble and the meek, and to see that the meek and not the mighty inherit the earth: (that the French Canadians and not our ambitious and exacting race populate Ontario). There is nothing so picturesque and definite as this in Thucydides' religion. It is much nearer the sombre creed of Tacitus, when he claimed to have produced evidence

to show that Heaven, if it is not careful for our peace of mind, is careful at least to punish our offences (Hist. 1. 3). That seems to be the conclusion very tentatively put forward by Thucydides in book I (1. 23).

The point is important because it is customary to say that Thucydides derided oracles and portents and was purely negative, scientifically negative on the question of religion.

It is scarcely so. If he does not propound a definitely religious reason for the calamities of Nature, earthquake, pestilence and famine, he comes as near to it as a man so sceptical can come. He sympathizes with the religious point of view, if he does not exactly endorse it, just as he sympathizes with Nicias, whose religious extravagances nevertheless he has had occasion to deplore.

There are some three passages on this subject and they are fairly consistent. There was an old oracle that a Dorian war would come and with it *λοιμός* pestilence or *λιμός* famine. (The passage of course is of prime interest to the students of pronunciation; it seems to establish almost beyond demur the proposition that the classical pronunciation of "oi" and "i" was identical, or nearly so, as it is identical in modern Greek: both "oi" and "i" are the French long "i" and the English long "e"). When the Peloponnesian war came and pestilence with it but not famine, people quoted the line with *λοιμός*. If there had been a famine—remarks Thucydides, they would have quoted it with *λιμός*. Some readers read a scoff at oracles here: there is no scoff at oracles, only a mild reference to the weakness of human nature, which adjusts its memory and its evidences to the accomplished facts.

Still less can hostility to the oracles of Greece be found in his comment on another oracle. This oracle said "*τὸ πελασγικὸν ἄργον ἄμεινον* (2,17)." Accordingly people argued that when the plague broke out in Athens after the occupation of this forbidden district the plague was Heaven's punishment for a violation of Divine Law. Thucydides interposes a mild protest, which certainly does not scoff at oracles. Rather he commits himself to the somewhat hazardous proposition that the prophet foresaw that when the days should come for the occupation of the Pelasgic district they would be days of mourning. The prophet foresaw that it would never be occupied to advantage: and that is all (Thucydides says) his oracle meant. That is to say, Thucydides has rationalised away the theory of Divine Vengeance as expressed in the special locality of the plague, but he has contrived to do so without disputing at all, rather while accepting, the authenticity and the historical accuracy of the ancient oracle.

And in the last and crucial passage of book I (1. 23) he will not even consent to rationalise away the theory of Divine Vengeance.

Rather he covertly suggests—he throws it out as a natural hypothesis—that the prevalence of Natural calamities, of earthquakes, eclipses, tidal waves and plagues, drought and famine, concurrently with the Peloponnesian war was *not* a mere coincidence. He will not pledge himself to the proposition that these things were the Divine penalties for an unnecessary, degrading, unnatural and impious war, for this would be going perhaps beyond the province of history. But he will at least support this proposition of the conscientious and God-fearing people of the day, to the extent of adding his testimony to the alleged synchronism: there *was* a synchronism. There actually were more cataclysms of Nature during the Peloponnesian war than during any other period of similar extent (1. 23). When a historian goes out of his way to call attention to this synchronism, it can hardly be doubted that he would have liked to go further, had the spirit of his circle and the growing science of the day permitted him to do so.

I will dwell yet a little longer on his sense of the “frightfulness” of the Peloponnesian war, and of the shock which it gave to God-fearing people. Thucydides seems very full of that sense of horror. Modern historians like Mahaffy sometimes claim credit for deprecating and depreciating the eternal and internecine feuds of the Greeks. They even extend their indifference and contempt to Athens’ battle for freedom against Philip, as if Athens ought to have despaired of herself, like Phocion, or ought to have sacrificed herself on the altar of futurity and humanity, in order that Alexander might the sooner over-run the East, and spread Hellenism and civilisation over Egypt and Asia Minor: whence, *viâ* Rome, it would reach the whole world, East and West alike, and go down to all ages. But whatever be thought of Demosthenes and Philip, and even though it be preposterous to expect of Demosthenes that sacrifice of Athens for Europe’s sake which the modern reader of Demosthenes may to-day accept with resignation and even with satisfaction, there will be a general tendency among the modern readers of Thucydides to accept his reprobation of the civil wars of the Greeks, and of the Peloponnesian war in particular.

His reprobation of the Peloponnesian war has two aspects one of which at least will commend itself. Thucydides, like Plato, if not like Aristotle, has no sympathy with or enthusiasm for Imperialism: for an Empire to be built up by Athens or any other Greek State over other nations, including in these other nations, many Greek States; he no doubt followed the policy of Pericles, who advocated the maintenance of the then Empire and the then sea power of Athens by means of a strong fleet but not the extension of the Empire. Pericles seems to have assumed that it was hopeless to unite Greece and

to conciliate Sparta, and therefore to have advocated against Sparta "a preventive war" as the Germans call it: but he warned Athens against a policy of adventure and world domination, such as came afterwards with Alcibiades and the Sicilian Expedition. If the other policy—the policy of domination in the East, instead of in the West, over Asia Minor and the Persian Empire, instead of over the Greeks of Sicily, had ever been seriously suggested to Pericles, as it suggested itself to Isocrates and to Aristotle and to Alexander, it is conceivable that he might have agreed, for this would have meant domination over Asiatics not over Greeks. But there was no room for such a suggestion in the divided state of Greece and its internal feuds.

Be that as it may, Pericles remained opposed to wars of conquest, and Thucydides evidently both in principle and from bitter experience followed Pericles. It may be even that he would have agreed with Plato, that the ideal Athens was not even the Athens of Pericles with the Athenian Empire of the year 431, but just the city of Athens and the adjoining Attica, just a Greek *πόλις* living in friendly relations with other Greek *πόλεις*, just a municipality as we call it; or a free city of the middle ages, Genoa, Venice, Bremen, without their external possessions. It may be that even to the same degree as Plato, Thucydides was a little-Athens man (*μικροπολίτης*). At any rate there is nothing to show that he would have disliked or did dislike, if he knew it, the Platonic ideal.

Modern British readers are less friendly to the city-state and to this intense and extreme decentralization, which comes to them as doubly "suspect"; "suspect" on account of all their associations, experiences and prejudices derived from the history of 2,000 years, and twice suspect as associated not with the name of Greece and the Greek *πόλις* and Plato and Thucydides, but with the ideals of Rousseau and a number of impracticable modern doctrinaires, French and others: Karl Marx and Bakounine and many members of the Paris Commune of 1871, who wanted to break up France into communes like the municipality of Paris.

But the other and second aspect of Thucydides' dislike of Imperialism is much more modern and commends itself just now to all of us. Thucydides' idea of Imperialism was far removed from the ideas associated with that word by reasonable Canadians, Australians, Afrianders and by the majority of the people of the Mother Country: the idea of a united Empire of free peoples, bound together in a perpetual defensive alliance with the minimum of machinery for that bond and therefore the maximum of good feeling and mutual forbearance: the idea of a generous loyalty to the past and its traditions: of a generous repudiation of narrow nativism and know-nothing-ism.

Imperialism to Thucydides was rather the idea still suggested by the word to the minds of a few fanatics and doctrinaires of Radical temperament in Great Britain, the idea of militarism, jingoism, flag-waving, red-painting. It was even worse than this, it was the idea suggested to Thucydides by the bitter evidence of the Peloponnesian war and to us by the bitter evidence of German "frightfulness." It was the idea that "Imperialism" means the most ruthless militarism and ambition in the conduct of war and the most shameless materialism and the most unscrupulous Macchiavelism in the conduct of diplomacy.

Thucydides discerned a progressive brutality and a progressive materialism in the Athenian treatment of the enemy and of the neutral states. It is no wonder that he became a little-Athens man.

The received rules of war were barbarous enough to begin with and before the Peloponnesian war began. On the other hand, the Athenian temperament was humanitarian enough—before the war—to largely cancel these rules. Athens was the one State when Pericles delivered his Funeral Speech, in which "virtue" ἀρετή stood not for virtue—valour, not for the religion of valour but for benevolence—humanity—generosity—charity: the men of "virtue" says Thucydides in his account of the plague, that is to say, the kindly man and the charitable (2. 51) died of the plague in the largest numbers. Athens before the war in fact had been the one Greek State which was to a certain degree Christian before Christ. And all this was lost by the brutalising influence of the war, or at least by the influence of the brutalised and materialistic spirit in which the war was waged. No wonder that Thucydides had ceased to be—if he ever was—an Athenian Imperialist.

Thucydides has told us that he wrote for all time and that his work would never be out of date. (1. 22). If any one wants to test that soaring ambition let him do what I was able to do recently. Let him sit down quietly and listen to two young students of Greek reading alternately from Thucydides, the dialogue at the end of Book V. called the Melian debate. One reader represents the unhappy and weak neutral—Melos: the other, the callous, cynical, militaristic and aggressive Athens. The readers translated almost literally: changed nothing but the names: put Belgium for Melos: and Germany for Athens: and Great Britain for Sparta. For nothing else needed to be changed; and we heard coming to us from the year 416, B.C., the first proof, the first edition, of the identical debate between Belgium and Germany, which was republished under other names and at various times between 1860 and 1914: but never so closely to the original as in 1914.

Thucydides therefore did something more than put forward a claim to anticipate future history, he did more than claim that history repeated itself. He did more than claim that history is written for the future, that the future may guide itself by the experience of the past: or—in the somewhat romantic and extravagant terms which are familiar to some of us from our school days—that history gives a young man all the advantages of age without its infirmities—all those claims I mean which have been definitely repudiated by some historians like Ranke, and which obviously leave out of sight the familiar experience, that no man, and *a fortiori*, no nation, will agree to be taught by any experience except his own—these claims were not only put forward by Thucydides, but so successfully established by him, that a dramatic debate, like the Melian dialogue, can be pitchforked bodily into the year 1914 as a *précis* of the diplomatic history of Belgium and Germany in that eventful year.

That debate indeed is doubly dramatic, as has been already suggested. It is not only dramatic in its form, its dialogue, it is dramatic no less in its intense though unspoken irony. It precedes Bks. VI, VII, and Bks. VI, VII introduce the fall of Athens. "Strength goeth before a fall" is the religion of Herodotus. The same religion, but spiritualised, deepened, purified, is the religion of Thucydides. By painting strength in darker colours as pride, by heightening the picture of Athenian arrogance and cynicism towards Torone, Scione, Mende, Melos, and the rest of the cities and states which resisted Athens, he has given the Creed of Divine Jealousy a more righteous cast, a more humane interpretation. The humanitarianism of Athens—the better mind of Athens—is overheard in Thucydides confessing the justice of the Divine retribution which has fallen on her: not merely because she was powerful and ambitious, but because her subservience to her ambition and to her lust of power had dimmed and blighted all her greater and more characteristic qualities. "The war up to 415 B.C. made Athens great and Athenians small": that is the comment to be read between the lines of Thucydides.

No man can say that modern Germany has not applied history to her politics—in spite of Ranke—: her politics have almost been made by her historians. It is a pity that her historians have not gone to ancient history, and in particular to Thucydides and the history of Athens, when they were looking for historical omens. The Melian dialogue might have warned Germany off Belgium, if they had still cared for their classics. Curiously enough they did see the parallel between Great Britain and Sparta but not between themselves and Athens, or between Belgium and Melos.*

* (*vide*—"What Germany thinks," p. 205 and foot note on Professor Reinhard Frank of Munich and Tübingen (p. 193).

There is little else to be found I think in Thucydides' history capable of throwing much light on his mind and personality. A man who so veiled his moral, religious, and artistic bias that the former is not easily understood (as in the verdicts on Nicias and Antiphon) while the two latter have been overlooked more or less entirely, until recently, is not likely to declare himself freely in smaller ways.

There is occasionally a touch, a hint of dry sarcasm. The Spartan Admiral Cnemus missed attacking the Peiraeus, so *he* said, by stress of weather. "If he had wished to make a better pace the weather would not have been an insuperable obstacle," (Bk II. 93), observes Thucydides. There is just one speech which is not merely dramatic, like the Melian dialogue, but full of personal colour or at least of national colour: the speech of the Spartan ephor Sthenelaides (Bk. I. 85. 86). Thucydides actually gives the speaker's name in this case, apparently because the speech is so full of character as to be too full of character, except as an individual type: too full even for a type of Sparta: more Spartan than the Spartans.

"The greater part of the Athenian argument I cannot understand. They have said a great deal in eulogy of Athens
"but they have not shown that they are not injuring our good
"allies: if they behaved well against Persia all the more
"shame on their behaviour to-day."

There seems a touch of individual portraiture here. If the name were not given, it might almost seem a touch of caricature; probably that is why the name is given. But this speech is exceptional, not only in its caricature, if there be caricature, but in the giving of a name to the speaker. Thucydides' craving for the impersonal, his ambition to record the laws of history and not the feats of passing and ephemeral individuals, banishes names, broadly speaking, from his history, where other historians of all ages would record them.

There is little else that occurs to me. Thucydides believes in fate. He is a fatalist even to the extent of believing that he can read fate and forecast the future, human nature being the same in all ages. Is it a sort of natural compensation that the man who believed in so little in which other men believed, who believed in so little that he glorifies conventionalism and conservatism just because it is conventional and conservative: who liked the conventional and conservative Nicias just because he appealed to his taste, his sense of manners and moderation: who canonises nothing in his history except the moderation of aristocrats—*ἀριστοκρατίας σώφρονος προτιμήσει* (III. 82: compare VIII. 24. *μόνοι δὲ Λακεδαιμόνιοι εὐδαιμονήσαντες ἅμα ἐσωφρόνησαν*) a moderation which no doubt, he would himself have admitted, is no special virtue, virtue being

merely a matter of circumstance, condition and opportunity or—lack of opportunity; which is no special virtue in the aristocrats but the natural result of their interests and their advantages, and therefore all the more useful and punctual, just because it is not dependent on the off chance of real virtue but is a natural product of conditions; is it a sort of natural compensation, I say, that this man who could see his way before him so little, who is so dubious of human effort, should at least conceive so confident a belief in Fate and in his power to read Fate?

It may be so. Nature abhors a vacuum. Some Faith a man must have obviously to write history at all: and if no other, then faith in fate and in the reign of laws which can be deciphered and interpreted; let it be counted to Thucydides for righteousness that he sometimes manages to anticipate the future so closely.

Again, is it a contradiction to be so impersonal and fatalistic and yet to desire the government of a State by its chosen spirits, by the elect, by a Pericles, when a Pericles is born at long intervals to guide a State?

I do not think so. Thucydides believed in fate: even in democracy as a result of fate, as an inevitable and disagreeable product at a certain stage of culture when universal education has made all questions open questions and has destroyed the rule of convention and old-established aristocracy. He disliked democracy as government from the street, as government without reflection, without knowledge, without experience of the past, without true education: as a government which has neither pride of ancestry, nor hope of posterity: as a government where the ordinary statesman can only take short views, for no views which are long, which are based on long experience, will commend themselves to the man in the street. The ordinary statesman must adapt himself to democracy in such an age, for democracy is an inevitable result of popular and universal education.

But if fate should produce at intervals a great demagogue—in the best sense of that term—a popular leader or demagogue who can yet by his force of eloquence and force of character impose himself upon the street and the State, upon popular opinion, a Pericles in fact, is it not better, is it not common sense, to exalt that demagogue and his government and to canonise his rule—however short its duration—and human life being short his rule will be short—as a happy incident, a blessed respite for a moment from the anarchy and seesaw which must otherwise mark the tragic career of democracy?

There are only two faiths possible, I think, to an historian: such a faith in Fate which I have endeavoured to interpret as the faith

of Thucydides, pessimistic enough though it be: and the other faith—which is very modern and Christian—in the perfectibility of human nature, even under democracy, or especially under democracy; a perfectibility which will enable even the man in the street to listen more and more to the teachings of experience, and to give even to his democracy that sweet reasonableness and that moderation which are natural enough without special virtues, just by force of circumstances and personal interests, to an aristocracy: to the wealthy, well-born and well-educated. Thucydides had no such faith in progress or in the evolution of human nature by itself and from within and by the very law of evolution: human nature is to be the same in all ages: its germ-plasms do not change.

Evolution implies a terminus *ad quem* as well as *a quo*: but many of us forget the terminus *ad quem* or at least we assume that the terminus *ad quem* of evolution and democracy is the stage which we ourselves have already reached, and practically we only think about the terminus *a quo*. That is, we all recognize clearly and consciously that society has developed from barbarism but we assume vaguely and unconsciously that it has now reached its zenith. So Thucydides: he recognized—no man more clearly—that Athens had evolved from piracy and general barbarism: that it had evolved to a certain stage of general education and thought: but,—he seems to have thought—Athens having reached that culminating point could go no further and must even recede into the degeneracy and anarchy, which education and thought themselves produce: must fall before the more brutal powers like Macedon, which, without education and thought, yet retained the more brutal and masculine virtues: the will to fight, the will to power, the power to raise armies, and a rough indifference to all the luxuries of thought and the artificial and hot-house life of the theatre and the law courts and the public assembly, “the fountains and the fooleries” called civilization. Then in time evolution would take its turn with these uncivilized powers: and they also would begin to decay by reason of their new virtues, their thought and education, before new barbarians. Fate destroys nations by their very virtues, and the terminus *ad quem* is soon reached, and the cycle starts afresh from a new deluge of some sort. Fate leads nations in a cycle: evolution is from one end of the cycle to the other: but the wheels soon revolve full circle, and then the evolution is over: at least for a time and for that nation. It is not a continuous evolution: it is strictly limited, with its beginning, its culmination and brief transitional period of glory—Athens under Pericles—and its decay. (This, by the way, I believe is also the doctrine of Chateaubriand’s first essay, his essay on Revolution: he was a student of Thucydides.)

It is not a cheering creed, but is it scientific? Can it be said to be unscientific just because it is not cheering: just because it offends a certain deep and sanguine instinct? That is a question for the theologians. Thucydides had no such theology as could make it seem unscientific to his mind. His mind was academic: the mind of an academic liberal: who is next door to a conservative: who lives in a semi-detached house with conservatism occupying the other half. Like Jowett, for example, Thucydides was liberal in theology and conservative in politics: liberal in education but conservative in broader and deeper things. He was of two minds about education and religion. He distrusted religion in details and in given cases—in the case of Nicias' superstitions about the moon, for example—but he welcomed it as a conservative force, as a force modifying the wheels of change, putting a break upon them. Conversely, he trusted education in details, wanted it for himself and men of his class, an upper class: but he distrusted it broadly and on larger grounds and in the field of politics as a solvent of the existing order of things, as a harbinger and herald of universal doubt and of that ever widening horizon of open questions, which is the mark of democracy and universal education, and the plague of books and lectures, and which ends in anarchy. Culture—universal culture at any rate—is anarchy. It is "sensibility without bread" as Goldwin Smith used to say. To know everything is to do nothing. Thucydides coined the epigram, resented it, but perforce illustrated it in himself. He was the scientific officer who lost a campaign because he had more science than energy: the type of officer with whom we have all been familiar of recent years, since the day when one scientific general failed to swear his boats up the Nile in time to relieve Gordon, and a second failed to hold the crest of Majuba against the escalating Boers. Science can do much in warfare—especially in modern warfare—but it cannot supply energy. It may easily diminish the energy of native will and natural force of character: "the native hue of resolution is sicklied o'er by the pale cast of thought." Thucydides could do nothing in the Athens of his days, or in the war in which, unfortunately for his reputation, he took an academic and a very ineffectual hand, except record its history.

Mémoires de la Société Royale du Canada

SECTION I

SÉRIE III

DÉCEMBRE 1916

VOL. X

A propos d'une opinion de Montalembert sur le Canada.

PAR ANTONIO PERRAULT.

PRÉSENTÉ PAR EDOUARD MONTPETIT, M.S.R.C.

(Lu à la réunion de mai, 1916.)

Pour nous reposer des opinions diverses qu'émettent les vivants au sujet du Canada, relisons ce qu'en pensèrent ceux qui "dorment dans le linceul des morts." Rien de passionné dans ce rappel des anciens jours. Les lèvres closes ne sauraient nous troubler. Seule la part de vérité qui survécut à leurs paroles éteintes émeut nos âmes. Les ans, en passant sur elles, ont aboli ce qu'elles contenaient de faux, d'accidentel. Pour les juger l'on se sent plus à l'aise. La lumière adoucie que l'étude projette sur ces choses d'autrefois, s'allie à la liberté d'esprit qu'assure le recul du temps.

Dans l'un de ces retours vers le passé canadien, notre intérêt était récemment arrêté par le jugement que porta sur notre pays le comte Charles de Montalembert, au cours d'un article qu'il publia dans le *Correspondant* de Paris le 25 octobre 1858. Ce nom qui domine le 19^{ème} siècle, attirera toujours la sympathie des Canadiens-Français. Qui d'entre eux pourrait demeurer indifférent au souvenir de cet orateur fameux qui couvrit de tant de gloire le verbe français et qui le montra si libre, si fière ?

L'article dont il s'agit était intitulé: "Un débat sur l'Inde au parlement anglais." Comment Montalembert vint-il à l'écrire et pourquoi y glissa-t-il ces quelques phrases touchant le Canada ? Signaler les circonstances qui arrêtaient un instant la pensée de ce grand Français sur les rives du Saint-Laurent; redire les ennuis que cette témérité lui valut dans son pays; et, dans une conclusion brève, rechercher la justesse ou l'exagération des idées qu'il entretenait alors à notre sujet, tel est l'objet de ces pages.

En 1858, Montalembert s'acheminait vers son déclin. Il ne devait mourir que le 13 mars 1870, mais déjà sa carrière publique était

en grande partie close. Elle avait duré une vingtaine d'années durant lesquelles son éloquente parole, en lui assurant de remarquables triomphes oratoires, n'avait eu qu'un objet: la défense des opprimés. En 1852, de Persigny, ministre de l'Intérieur, pour se justifier de son opposition à Montalembert, écrivait: "Il a le caractère trop chevaleresque; il aime trop défendre les faibles" . . . Cette parole était exacte et la carrière politique de Montalembert la justifie. A partir du 14 mai 1835—date où il prêta serment et prit séance à la chambre des pairs,—il garda toujours sa liberté entière, prêt à se jeter à la défense de toutes les causes dont il avait reconnu la justice. Il se donna pour ligne de conduite de ne se lier à aucun parti. Il ne s'attacha à aucun chef,—ni à Guizot, représentant à la Chambre les idées et les intérêts de conservation intérieure et extérieure; ni à Thiers, soucieux de concilier 1830 avec la démocratie; ni même à Berryer, la personnification de la fidélité politique, le légitimiste pour qui le salut de la France s'identifiait avec le maintien de la dynastie des Bourbons. Du gouvernement de Louis-Phillippe Montalembert disait avec quelque fierté: "J'ai été son sujet, jamais son serviteur."

Ce mot, il eût pu le redire à chaque changement de régime. Quel que fût le chef qui présidât aux destinées de la France, Montalembert demeura son propre maître. Il n'eut point d'autres guides que son amour du catholicisme, son dévouement à l'Église, son attachement à la liberté. Une nation, une institution, une personne est-elle menacée dans ses droits? Montalembert, debout à la tribune, met aussitôt au service de leur cause une voix demeurée incomparable de fierté, de droiture, d'éloquence. La Pologne déchirée, l'Église catholique attaquée, Pie IX exilé, la liberté de l'enseignement en France n'eurent point de défenseurs plus constants ni de plus éloquents.

Le lendemain de sa mort, l'*Univers* de Louis Veuillot écrivait: "M. de Montalembert a été de tous les laïques de ce temps celui qui a rendu à l'Église les services les plus grands et les plus dévoués."¹

Nous pouvons aujourd'hui déposer semblable couronne sur le front d'un autre laïque.

Dans l'histoire des luttes qui se livrèrent en Europe, au dix-neuvième siècle, sur le terrain religieux et social; dans le récit des efforts accomplis par certains esprits sincères pour tourner la démocratie conquérante vers un idéal de paix et de justice, deux noms retiennent notre attention: Charles de Montalembert et Albert de Mun. Il est permis, je pense, de les associer l'un à l'autre et d'ensevelir ces deux chevaliers dans un même linceul d'admiration et de gloire.

¹ Cité par Lecanuet, Montalembert, vol. III, p. 474.

En des temps différents, avec des méthodes diverses, au milieu d'épreuves et de travaux non pareils, ils furent tous les deux des hommes de haute marque, au caractère fait de droiture, de générosité, de désintéressement. Leur intelligence si ouverte devina les difficultés et les besoins des temps à venir. Ils furent tous deux des orateurs hors de pair que passionnèrent l'Église, la France, les œuvres multiples qui assurent la grandeur de l'une et de l'autre, et ils consacrèrent à les défendre leur vie entière. Montalembert et de Mun, figures de parlementaires attachantes entre toutes, serviront de modèles à qui voudra aller au peuple pour y atténuer les misères et y faire régner plus de justice.

C'est à la question de la liberté d'enseignement que Montalembert dut son dernier grand triomphe oratoire.

L'instruction publique fut toujours en tous pays—nous, Canadiens, nous en savons quelque chose—une question ouverte, jamais tout à fait résolue. Chez tous les peuples, le pouvoir, poussé par le fanatisme, le préjugé, l'intolérance, cherche à mettre la main sur cette arme précieuse avec laquelle l'on forge l'âme des jeunes. Aussi ceux que préoccupent les lendemains veillent-ils sur les maisons d'enseignement pour qu'elles gardent, dans une inviolable liberté, une éternelle durée.

Quand Montalembert commença sa vie publique, la question de la liberté de l'enseignement passionnait, en France, les esprits. La lutte autour d'elle provenait des monopoles créés par Napoléon 1^{er}. Voulant réorganiser l'enseignement, il créa l'Université dont il se fit une arme pour régner, en lui faisant une situation unique. Les catholiques s'aperçurent que le résultat général de l'enseignement qui y était donné était la ruine des croyances: ils n'eurent de cesse qu'après avoir conquis la liberté de l'enseignement, "l'une des faces de la question plus vaste encore, celle de la liberté de l'Église."¹

De 1835 au 15 mars 1850—date où fut votée la loi Falloux qui garantissait à la France la liberté d'enseignement—Montalembert lutta sans relâche pour la conquête de ce droit. Et, quand elle fut assurée aux catholiques de France, il put se dire que l'œuvre principale de sa vie était achevée. Il en avait posé le terme à l'heure propice, alors que, l'Empire s'annonçant, la vie parlementaire en France allait devenir moins propre aux discussions libres.

D'abord sympathique au prince président, il perdit vite les espérances qu'il avait fondées sur Louis Napoléon. Après le coup d'État du 2 décembre 1851, au lendemain du 10 décembre 1852, alors que la plupart des catholiques de France adhéraient à l'Empire et

¹ Mgr. Ricard, *Vie de Montalembert*, pp. 132 et sq.

se ralliaient derrière Napoléon III, alors qu'une grande partie de l'épiscopat et du clergé prenait pour devise: "Dieu et l'Empereur," Montalembert, lui, observait à l'égard du nouveau pouvoir une attitude de réserve, puis de résistance et, finalement, d'opposition. Il devina que le second Empire, fondé sur un coup de force, ne serait guère favorable aux libertés populaires, que l'Église serait la première à souffrir de ce despotisme renouvelé. Et l'histoire reconnaît que ce fut Montalembert et ceux qui partageaient ses vues, sur cette question, qui virent juste. Elle confesse que "l'adhésion enthousiaste du clergé à l'Empire fut pour l'Église une vaste déception", que "les résultats de ce ralliement furent négatifs" et que Napoléon III n'accorda point les revendications que lui firent entendre les catholiques.¹

A raison de cette attitude, Montalembert perdit, en 1852, la confiance de ces derniers. Sa mauvaise fortune se continue et, en 1857, à 46 ans, il est rejeté de la vie publique. Au reste, si de 1851 à 1857, il continua de représenter, à titre de député, le Doubs, il n'eut sur le corps législatif aucune emprise.

Du chagrin que cette retraite forcée lui causa nous trouvons une preuve dans la lettre que, le 19 octobre 1854, il adressait, de son château de la Roche-en-Breny, à l'honorable P.-J.-O. Chauveau.

Chauveau avait fait remettre à Montalembert un exemplaire de son roman de mœurs canadiennes, de son *Charles Guérin*. Montalembert le remercie de ce livre et de la sympathie que cet envoi lui a manifestée. Montalembert écrit à Chauveau: "Quand on a péniblement tracé son sillon au milieu des obstacles et des mécomptes de toute nature, et surtout quand après vingt ans de vie publique on se trouve condamné à l'inaction et à l'obscurité, parce qu'on n'a pas voulu s'associer aux palinodies de ses contemporains et à l'abaissement de son pays, il est doux de rencontrer au-delà des mers l'approbation d'une âme telle que la vôtre, monsieur."²

Sentant qu'il n'était point fait pour un tel régime politique, Montalembert en prit donc son parti et il se tut.

Pourtant, se pouvait-il qu'il se réfugiât tout entier dans le silence? Une voix comme la sienne ne devait se taire qu'à la mort.

Il profita de sa réception à l'Académie française, le 5 février 1852, pour faire entendre une éloquente profession de foi aux causes qui avaient été la passion de sa jeunesse et de sa maturité. Élu directeur de cette compagnie, il prononça, le 17 août 1857, devant les cinq Académies de l'Institut, sur la jeunesse du second Empire, un discours qui, par sa portée générale, convient même aux jeunes

¹ Lecanuet, op. cit., vol. III, pp. 55, 97, 98, 101, 176, 196.

² Lettre reproduite au long dans la préface qu'Ernest Gagnon mit à ce roman de Chauveau, édition illustrée, 1900, Beauchemin.

hommes des républiques ou des monarchies constitutionnelles et qui aujourd'hui encore ne se lit point sans profit.

Puis, Montalembert écrivait. Admirons, en passant, cette trempe virile de l'âme qui porte les parlementaires français "à chercher dans l'activité littéraire l'emploi des loisirs que leur laisse la politique." Guizot, Thiers, Cousin, Villemain, Montalembert, en se remettant aux lettres, Berryer, Dufaure, par leurs plaidoiries, montrèrent de quelles ressources variées leur esprit était riche.

Montalembert, entre temps, voyageait.

Dans ces excursions, un pays l'attirait entre tous, sa terre de prédilection, pourrait-on dire, l'Angleterre.

Bien des liens l'y rattachaient. Il y était né le 15 avril 1810, à Londres. Sa mère était anglaise et protestante. Et ce fut la gloire de Montalembert de contribuer à sa conversion.

Lorsque son père, fervent catholique, émigré en Angleterre en 1792, rentra en France avec Louis XVIII et prit du service dans la diplomatie, il laissa l'enfant à l'aïeul maternel, M. Forbes. Celui-ci, puritain austère et tendre à la fois, l'éleva sur ses genoux. Quelles impressions fit sur l'âme de Montalembert l'influence opposée de ces deux hommes qui, au seuil de sa vie, lui montrèrent deux faces du monde religieux, son père catholique et pair de France, son grand-père protestant, imbu des traditions du libéralisme anglais? De là sans doute naquit en son cœur son grand amour du catholicisme, ainsi se fit dans son esprit l'infiltration des idées libérales qui devaient y laisser une empreinte impérissable.

Toute sa vie, aux jours d'activité parlementaire et au temps de sa retraite, il garda les yeux fixés sur l'Angleterre. Et l'on a pu dire que "cette première éducation anglaise comme le sang de la libre et fière Albion qui, du chef de sa mère, coulait dans ses veines, se sont trahis pendant toute son existence par une vive admiration pour les caractères et les institutions d'Outre-Manche."¹

"Quand je sens—écrit-il en tête de cet article dont nous allons parler—quand je sens que le marasme me gagne; quand les oreilles me tintent, tantôt du bourdonnement des chroniqueurs d'antichambre, tantôt du fracas des fanatiques qui se croient nos maîtres et des hypocrites qui nous croient leurs dupes; quand j'étouffe sous le poids d'une atmosphère chargée de miasmes serviles et corrupteurs, je cours respirer un air plus pur et prendre un bain de vie dans la libre Angleterre."²

¹ Mgr. Besson, cité par Mgr. Ricard, op. cit., p. 7.

² "Un débat sur l'Inde au parlement anglais" par Charles de Montalembert (le *Correspondant*, vol. 45 de la collection, pp. 205 et sq., le 25 octobre 1858).

Il y fut au printemps de 1858. Le grand parlementaire qu'il était, le constant admirateur de l'Angleterre, qu'il n'avait cessé d'être, furent servis à souhait. Pendant son séjour à Londres, il fut à même d'admirer le jeu des institutions britanniques. Il fut le spectateur d'une discussion au cours de laquelle les hommes d'État les plus remarquables de ce pays montrèrent le fonctionnement à la fois souple et compliqué d'un parlement régi par la constitution anglaise. En songeant aux fantômes qui peuplaient le Corps Législatif de la France sous Napoléon III; en s'attristant—selon son propre mot—sur "le royaume des ombres" que formaient à cette époque les représentants du peuple en son pays, quelle surprise enthousiaste ne dut-il pas éprouver. Il voyait les membres de la Chambre des Communes et les Lords discuter en toute liberté une question où s'entremêlaient les intérêts de l'Angleterre et les droits de sa plus populeuse colonie, l'empire des Indes.

A ce moment—printemps de 1858—l'Angleterre était, à un degré très haut, préoccupée de l'état de l'Hindoustan et du sort de l'insurrection qui, quelques mois auparavant, avait éclaté dans les provinces septentrionales de cette immense région.

Quelle était la nature de cette révolte, de cette crise qui, au dire de certains publicistes, "fut le plus grand péril de l'Angleterre impériale au XIX^{ème} siècle",¹ qui ne fut pas étrangère à la disparition de la Compagnie des Indes et à la proclamation de la reine Victoria comme impératrices de cet empire?

Au nord et au nord-ouest de l'Inde, les indigènes s'étaient soulevés contre le pouvoir de l'Angleterre. Il ne s'agissait pas seulement d'une mutinerie; il n'y avait pas que les Cipayes—soldats hindous engagés au service des Européens, et en particulier des Anglais,—qui avaient tourné leurs armes contre leurs chefs. La révolte était provoquée par les griefs que l'armée, le sentiment national et la fanatisme religieux entretenaient contre les Anglais,—occupants et maîtres de l'Inde. Les historiens de cette heure difficile ont retrouvé, sous cette révolte, les causes générales qui gisent sous toute révolution, causes que Bossuet et Bacon ont si bien définies. Ils en ont indiqué aussi les raisons particulières; les privilèges accordés à certaine partie de l'armée; l'attachement des Hindous à leurs castes et la crainte que l'Angleterre ne les abolît; la conviction qu'on voulait

¹ Henri Bourassa: "Que devons-nous à l'Angleterre," p. 16.

Justin McCarthy écrit dans "A History of our own time," Vol. II, p. 34: "Never in our time, never probably at any time, came such news upon England as the first full story of the outbreak in India."

détruire leur foi et ses rites—ne répétait-on pas un peu partout que les femmes seraient bientôt forcées d'aller dans les rues tête découverte?—le commandement des troupes donné presque exclusivement à des Européens et, partant, à des chrétiens; les annexions faites par lord Dalhousie de certaines provinces; l'influence territoriale et politique des nouveaux venus qui gênait celle des princes Hindous, si nombreux et depuis si longtemps chefs reconnus de ces contrées.

Quel événement opéra le déclanchement? Quelle étincelle mit le feu aux poudres? Comme l'histoire nous en offre maints exemples, nous retrouvons ici un petit fait—apparemment sans importance—déchaînant des passions longtemps contenues et donnant aux causes complexes que nous venons de signaler l'occasion de produire leurs effets révolutionnaires.

Quand, en 1856, le gouvernement fit distribuer aux Cipayes la carabine perfectionnée "Enfield", le bruit se répandit dans l'Inde que les cartouches que lancerait cette carabine rayée étaient enduites de graisse de vache et de la graisse de l'animal que n'aiment point les Juifs. C'en était assez pour amener les Hindous—qui vénèrent la vache—et les Musulmans—qui trouvent immonde le porc.

En janvier 1857, l'ordre est donné de ne plus se servir de ces cartouches. En mai 1857, le gouverneur général publie une proclamation assurant l'armée du Bengale que la rumeur est fausse. Rien n'y fait: l'étincelle a allumé l'incendie. La mutinerie commence. On sévit contre les soldats; et ceux qui sont l'objet de ces premières punitions apparaissent comme des martyrs de leur foi. Les soldats qui restent courent à Delhi et proclament empereur des Indes le vieux roi réfugié dans cette ville. La mutinerie, possédant maintenant un chef et un drapeau, se change en une révolution contre le gouvernement de l'Angleterre. Ce que les révoltés veulent désormais, c'est le rétablissement de la dynastie de Delhi. La mutinerie de quelques soldats a fait place à une guerre nationale et religieuse.

Sans tarder, l'Angleterre s'efforça d'arrêter ce mouvement révolutionnaire; il menaçait sa puissance au cœur même d'un empire, d'où elle a tiré tant de puissance, de richesse et de prestige. Delhi fut reprise le 20 septembre 1857; le 19 mars 1858, Lucknow—capitale de la province de Pendjab—était entièrement aux mains des Anglais. Bien que l'Angleterre ait célébré seulement le 1er mai 1859, par un jour d'actions de grâces, la pacification de l'Inde, en réalité la chute de Delhi et de Lucknow, les deux centres les plus importants de l'insurrection, avait été le dernier coup porté à la rébellion.

Lord Canning était alors gouverneur-général de l'Inde. A lui incombait donc le devoir de réprimer cette révolte. Le 3 mars 1858, il publiait une proclamation. Elle prononçait, sous le nom de réunion

au domaine britannique, la confiscation absolue de tout droit de propriété appartenant aux feudataires du pays, aux chefs et aux propriétaires fonciers du royaume d'Oude. Lord Canning n'exemptait de cette confiscation que les terres appartenant à six de ces grands feudataires, nommément désignés, en récompense de leur loyauté au gouvernement anglais, durant la révolte.

L'acte de Lord Canning, blessait profondément non seulement les intérêts les plus chers d'une population indigène de cinq millions d'âmes, mais encore la conscience de certains hommes d'État Anglais.

Dès le 19 avril 1858, lord Ellenborough—membre du ministère de lord Derby et président du bureau chargé d'administrer les affaires de l'Inde—expédiait à lord Canning une dépêche célèbre. Il y signifiait au gouverneur général le blâme du gouvernement métropolitain. "Nous désirons, écrivait lord Ellenborough, que l'autorité anglaise dans l'Inde repose sur l'obéissance d'un peuple satisfait. Il n'y a pas de satisfaction possible là où règne la confiscation. Il n'y a pas de force au monde qui puisse faire durer un gouvernement dans un pays dont la population est exaspérée par le sentiment de l'injustice. Et, quand même cette force existerait, il faudrait désirer qu'elle ne pût jamais réussir."

Si l'Angleterre n'a pas toujours mis en pratique ce principe de sa politique coloniale, l'on doit, du moins, savoir gré à lord Ellenborough de l'avoir, en une occasion opportune, si clairement exprimé.

Quelle répercussion eurent en Angleterre et la proclamation de lord Canning et la dépêche de lord Ellenborough qu'elle avait provoquée? Justin McCarthy—qui semble justifier l'acte de lord Canning—remarque que celui-ci adopta, en somme, un principe politique à peu près semblable à celui que suivit lord Durham quand il vint au Canada en 1838. D'après lui tous deux furent contraints, par les circonstances difficiles au milieu desquelles ils gouvernaient, à mettre pour un temps de côté l'autorité de la loi, à exercer, sur la vie et les propriétés des citoyens, les pouvoirs d'un dictateur afin que la paix et l'ordre fussent rétablis. Justin McCarthy admet cependant qu'à première vue la proclamation de lord Canning apparaissait dictée par le despotisme.¹

Cependant, ce fut surtout la dépêche de lord Ellenborough qui causa en Angleterre surprise et mécontentement. Ce que l'on vit tout d'abord, dans la manière d'agir de lord Ellenborough, ce fut l'imprudence qu'il y avait à désavouer ainsi, pendant que la guerre durait encore dans l'Oude, la politique antérieure relativement à cette contrée et à paralyser l'autorité du gouverneur-général. Ce

¹ Justin McCarthy, *op. cit.*, vol. II, pp. 92 et sq.

fut aussi la forme hautaine dont lord Ellenborough avait revêtu sa censure: l'on fut froissé du langage dont un homme tel que lord Ellenborough usait à l'égard d'un homme tel que lord Canning.

La question fut tout de suite portée devant le parlement anglais. Il nous est bien permis aujourd'hui de le penser: ceux qui proposèrent une motion de censure contre le ministère n'étaient pas uniquement mûs, ainsi qu'ils le disaient, par les intérêts de l'humanité, de la population de l'Inde ou même de la politique coloniale anglaise. Il n'y avait que quelques mois que le gouvernement de lord Derby dirigeait les affaires publiques.¹ Dans la conduite de lord Ellenborough les adversaires de ce ministère virent un bon moyen de prendre une revanche.

Lord Palmerston et les whigs dont il était le chef, pouvaient-ils, en cette circonstance, ne pas se souvenir du mot que maints politiciens répètent sans cesse à leurs adversaires: "Ote-toi de là que je m'y place." ?

Ils virent, dans ces agitations de l'Inde et particulièrement dans la dépêche de lord Ellenborough, l'entrave qui arrêterait la marche du ministère de lord Derby. C'était pour eux l'occasion de reprendre le pouvoir.

Leurs efforts furent peine perdue. Lord Ellenborough donna aussitôt sa démission, en déclarant qu'il avait agi de sa propre autorité sans consulter ses collègues. D'autres nouvelles reçues de l'Inde modifièrent la situation. Il s'en suivit que la motion de censure présentée par l'opposition à la chambre des Lords fut rejetée et que celle qu'avaient présentée les amis de lord Palmerston à la Chambre des Communes dut être retirée.

Cette victoire du ministère de lord Derby ne fut toutefois gagnée qu'après un long et remarquable débat dont Montalembert fut, en mai 1858, le témoin ému. Il entendit les députés anglais les plus éloquents de ce temps-là—Gladstone, Disraëli, Roebuck, Bright, John Russell—exposer les principes qui devaient présider à la politique coloniale de l'Angleterre. De la galerie où il se trouvait, il dut souffrir de ne pas pouvoir descendre dans l'arène, prendre siège au milieu de représentants jouissant d'une telle liberté de discussion. Combien il devait alors regretter que la France n'eut pas été capable de se soustraire au despotisme qui l'écrasait pour se doter d'institutions parlementaires semblables à celles de sa rivale d'Outre-Manche. Et Montalembert rentra en France plus attristé sans doute que jamais de n'y retrouver, pour tout parlement, selon ses propres expres-

¹ Il avait succédé au ministère de lord Palmerston, tombé pour des causes qui n'étaient pas étrangères à la tentative d'assassinat faite à Paris le 14 janvier 1858 par l'italien Orsini sur la personne de Napoléon III.

sions, qu'un "purgatoire législatif", qu'une "cave sans air et sans jour." Selon son aveu, il quittait "la terre des vivants pour la mer morte."

Quelle ne fut pas sa surprise, en arrivant en France, de lire dans l'*Univers* cette déclaration de Louis Veuillot: "Le parlement anglais vient de jouer à grand appareil une de ces farces, comme on en trouve beaucoup dans l'histoire des assemblées délibérantes"! Montalembert, indigné de ce que l'on appelât "farce" cette discussion qui venait de l'enchanter; indigné de cette invective à l'adresse de l'Angleterre qu'il admire et de ses institutions parlementaires qu'il envie pour son pays, veut rétablir les faits et il publie dans le *Correspondant* cet article de plus de 70 pages intitulé: "Un débat sur l'Inde au parlement anglais."

Après avoir raconté, en des phrases "pleines de vie, de couleur et d'éloquence", l'importante discussion dont nous avons parlé, Montalembert s'élève plus haut. Son regard se porte à la fois sur le passé et l'avenir de l'Angleterre, et il juge toute sa politique, ses affaires internes, ses relations avec ses colonies et les puissances continentales de l'Europe. Son article est donc intéressant de plus d'un point de vue. Aujourd'hui encore, l'on s'arrête avec plaisir à ces observations justes sur les mœurs des Anglais et leur rôle politique dans le monde.

Par exemple, aux yeux de Montalembert, les dangers que l'Angleterre courait en 1858 provenaient non de sa politique intérieure, mais de ses relations avec les autres peuples. S'il avait une confiance entière dans l'initiative et l'énergie individuelle des Anglais, ainsi que dans les œuvres et les associations qu'elles créent; s'il applaudissait à la persévérante ardeur que mettait l'élite de la nation anglaise à obtenir les réformes sociales et administratives, Montalembert, d'autre part, s'inquiétait de l'attitude que l'Europe commençait de prendre à l'égard de l'Angleterre. Les causes de cette hostilité croissante des pays continentaux à l'égard des Îles britanniques, Montalembert les voyait dans le fait que les idées libérales progressaient en Angleterre, tandis que les grands États du continent s'acheminaient de plus en plus vers le pouvoir absolu. Il les voyait aussi dans l'égoïsme britannique qui venait de se déployer de nouveau dans l'affaire de l'isthme de Suez, dont l'Angleterre voulait fermer à tous la porte. Il les voyait enfin dans le fait que les armées anglaises avaient, "injustement" disait-il, "mais incontestablement, perdu leur prestige."

À ce sujet Montalembert, laissant son amitié donner des conseils à l'Angleterre, lui demande, afin de prévenir une catastrophe, "de ne plus s'aveugler sur la nature et l'étendue de ses ressources." Il

va même jusqu'à écrire:—"Ses forces militaires et surtout les connaissances militaires de ses officiers et de ses généraux sont évidemment au-dessous de sa mission. Ses forces maritimes peuvent être, sinon dépassées, du moins égalées, comme elles l'ont déjà été par les nôtres sous Louis XIV et sous Louis XVI, comme elles le seront encore dès que notre honneur et notre intérêt l'exigeront. Elle se fie trop à sa gloire passée, à la bravoure naturelle de ses enfants. Parce qu'elle est essentiellement guerrière, elle se croit à tort au courant des progrès modernes de l'art de la guerre et en état de résister à la supériorité du nombre, de la discipline et de l'habitude des camps."

Cependant ces considérations ne furent pas assez fortes pour ravir à Montalembert son admiration pour l'Angleterre. Que de raisons il trouvait pour proclamer sa supériorité dans plus d'un domaine. Il trouvait particulièrement remarquable la politique coloniale de ce pays. Tout en avouant, sur ce chapitre, des fautes, des écarts, des égarements, il déclare que, dans l'administration des colonies, "brille de tout son éclat le génie britannique. Ce génie, partout et toujours, a égalé, sinon surpassé en sagesse, en justice, en humanité, les autres races européennes qui ont tenté les mêmes entreprises." Il reconnaît que "l'Angleterre, surtout depuis qu'elle a glorieusement expié sa participation à la traite des nègres et à l'esclavage colonial, peut s'enorgueillir d'avoir échappé à la plupart des lamentables aberrations" qui ont caractérisé l'administration coloniale de certaines autres puissances européennes. Et il cite des exemples, les Indes d'abord.

"Y a-t-il dans l'histoire, écrit-il, beaucoup de spectacles plus grands, plus extraordinaires, plus propres à honorer la civilisation moderne que celui de cette compagnie de marchands anglais qui a vécu deux siècles et demi et qui gouvernait hier encore, à deux mille lieux de la métropole, près de deux cents millions d'âmes, par l'entremise de huit cents employés civils et de 15 à 20,000 soldats?" Mais l'Angleterre a fait mieux, continue Montalembert, elle a formé non seulement des colonies, mais des peuples. Elle a créé les États-Unis en les "dotant de ces libertés provinciales et personnelles qui les ont mis en état de s'émanciper victorieusement du joug d'ailleurs si léger de la métropole." Il cite aussi l'Australie. Et sa démonstration semble convaincante. Tant et de si belles colonies semblent attester la puissance et la dextérité de la main qui les dirige.

Pourtant, Montalembert ne s'arrête pas là et il invoque un suprême argument. Peut-être craignait-il que ses lecteurs ne fussent pas gagnés par ceux qu'il venait de rappeler. Peut-être allaient-ils voir, dans l'Inde, surtout la grande mutinerie à peine réprimée, aux États-Unis le drapeau de l'Indépendance, dans l'Australie la colonie

pénitencier où, au 18^{ème} siècle, le gouvernement anglais envoyait les forçats pour purger la métropole de ses criminels incorrigibles.

Pour empêcher ses lecteurs de douter de la supériorité de l'Angleterre, du point de vue de la politique coloniale, pour leur fournir une raison additionnelle, et irréfutable celle-là, d'y croire, il leur nomme le Canada.

"Au Canada, écrit-il, une noble race française et catholique, arrachée malheureusement à notre pays, mais restée française par le cœur et par les mœurs, doit à l'Angleterre d'avoir conservé, ou acquis, avec une entière liberté religieuse, toutes les libertés politiques et municipales que la France a répudiées; elle a vu sa population décuplée en moins d'un siècle, et va servir de base à la nouvelle fédération qui, des bouches de l'Orégon à celles du Saint-Laurent, sera un jour la rivale ou la compagne de la grande fédération américaine."¹

Dans la série des arguments qu'il trouve pour vanter la politique coloniale d'Albion, notre pays apparaît donc, aux yeux de Montalembert, comme la raison décisive. Il ne s'agit ni du passé, ni de l'avenir. Pour lui les triomphes du génie colonisateur de l'Angleterre sont là, exposés aux yeux de tous. Qui pourrait en douter?

On en douta si bien que l'on s'émut en haut lieu. En écrivant cette phrase touchant le Canada—comme, du reste, en rédigeant tout cet article—Montalembert n'avait pas que le dessein de rendre justice à son amie l'Angleterre. Il avait une pensée de derrière la tête. Comme il arrive d'ordinaire pour ces sortes de pensées, il ne parvint pas à la cacher. Viser Napoléon III, montrer le contraste entre la liberté dont jouissaient le Royaume-Uni et ses possessions d'outre-mer et l'esclavage doré sous lequel ployait, depuis 1852, la France impériale, telle était bien l'intention véritable de l'auteur.

Napoléon III et ses ministres ne furent pas lents à le comprendre; ils résolurent de poursuivre Montalembert et le *Correspondant*.

Les gens de lettres—disait Napoléon III à Clarendon, ambassadeur d'Angleterre—les gens de lettres conspirent contre moi; "ils introduisent dans des sujets qui en apparence ne touchent ni à la politique ni à la France les allusions les plus hostiles et les plus injurieuses pour moi. En frappant un homme aussi illustre que Montalembert, j'ai voulu faire un exemple qui jette dans ce parti une salubre frayeur."²

Ce procès politique fut l'un des plus importants qui marquèrent le Second Empire, le procès à vrai dire du 2 décembre.

¹ Le *Correspondant*; article de Montalembert déjà cité, pp. 208, 209, 266, 268, 269.

² The Grenville Memoirs, VIII, p. 219, cité par Lecanuet, op. cit., vol. III, p. 185.

Les délits relevés par la prévention étaient : excitation à la haine et au mépris du gouvernement de l'empereur ; attaque contre les droits et l'autorité de l'empereur ; attaque contre le respect dû aux lois ; tentative de troubler la paix publique.

Notez que la phrase touchant le Canada était l'un des chefs d'accusation. Dans ce passage l'Empereur et ses ministres avaient vu un parallèle blessant entre le régime sous lequel vivait la France et la libre constitution de l'Angleterre.

Pauvre Canada ! Ses relations avec la France officielle auront eu d'étranges destinées.

L'on redit, parfois, au foyer paternel, le nom de la petite fille laissée jadis aux mains d'étrangers, puis oubliée. Si l'on se souvient d'elle, c'est pour blâmer celui qui a osé dire : "cette orpheline a grandi elle est devenue robuste et belle ; ces étrangers lui ont témoigné une sympathie dont la mère n'a pas été capable à l'égard de ses autres enfants qui restèrent auprès d'elles."

Encore si dans ce souvenir l'on pouvait voir le regret du trésor perdu, la trace des larmes que la séparation aurait mises au bord des yeux ! Mais non : le sort de cette fille n'est rien. Si la mère s'indigne, c'est que son amour-propre est froissé. Dans le rappel du nom de l'enfant abandonnée, elle voit une atteinte à son orgueil.

A cinquante ans de distance, arrêtons-nous un instant et voyons comment, en cette circonstance, la France de Napoléon III s'occupa du Canada.

C'est le 24 novembre 1858 que commença l'audience. L'accusé avait été assigné devant la 6ème Chambre du tribunal de la Seine, jugeant en police correctionnelle.

D.—Comte de Montalembert, quel est votre prénom ? demande le président.

R.—Charles.

D.—Votre profession ?

R.—Ancien pair de France, membre de l'Académie française.

D.—Vous avez dans des passages incriminés divisé la société française en deux camps, l'élite des honnêtes gens, dans laquelle vous vous rangez, et les lâches, c'est-à-dire, suivant vous, les huit millions de Français qui ne partagent pas votre manière de voir.

R.—Il a toujours été permis de dire qu'il y a dans le monde des honnêtes gens et des lâches ; je n'ai outragé personne.

D.—Vous connaissez mieux que personne la valeur des mots et si dans un salon vous divisiez ceux qui s'y trouvent en lâches et en honnêtes gens, croyez-vous que ceux que vous désigneriez comme des lâches ne se trouveraient pas outragés ?

R.—Si je disais qu'il y a des lâches et que quelqu'un me répondit: "Vous parlez de moi", je lui dirais: "J'en suis fâché pour vous."¹

Les grandes affaires, a-t-on dit, ne sauraient se passer des grands avocats. Elles les cherchent et, au besoin, les créent.

Montalembert fut défendu par Berryer et le *Correspondant* par Dufaure. Berryer, par la dignité de sa vie, par l'indépendance qu'il manifesta à l'égard de tous les pouvoirs, par l'alliance du sentiment monarchique avec le goût des libertés modernes, par la supériorité de son talent et l'excellence dont il fit preuve dans l'exercice de sa profession, avait mérité depuis longtemps le titre de roi du Barreau. Il restera de notre Ordre l'honneur et la gloire. Dufaure, ministre sous la monarchie de Juillet, rejeté ensuite hors la politique par le Coup d'État du 2 décembre, trouva la virilité de recommencer sa vie d'avocat et de s'élever au premier rang, par les ressources de son esprit, par ses plaidoiries faites de dialectique, de clarté, d'éloquence.

Il faut relire les paroles que tous deux firent entendre pour la défense de leur illustre client, celles de Berryer surtout. Ce ne fut pas seulement la cause de Montalembert qu'il soutint, mais, "grâce à ce privilège qu'ont les grands avocats de parler d'eux-mêmes en même temps que de leurs causes", il défendit sa propre vie, ses idées, il vengea son parti, ses amis, l'assemblée nationale, le régime parlementaire. On voit jusqu'à quel degré d'audace peut s'élever l'éloquence judiciaire, en l'entendant discuter les lois existantes, le second empire, l'empereur. De quelle apostrophe hardie il usa à l'égard de celui-ci en affirmant que la loi en vertu de laquelle Napoléon III voulait faire condamner Montalembert, lui, Napoléon III, l'avait violée tout le premier!

En parlant de cette plaidoirie, Edmond Rousse écrivait à un ami: "Ce n'est pas un homme éloquent, le débris d'un grand orateur, mais c'est l'éloquence même, si l'éloquence est cette puissance mystérieuse qui agit à la fois sur les nerfs, sur les muscles et sur le cœur de ceux qui écoutent. Il a été aussi loin qu'il soit possible d'aller."²

Montalembert avait écrit: "Lorsque les oreilles me tintent du bourdonnement des chroniqueurs d'antichambre, je vais prendre un bain de vie dans la libre Angleterre."

"Le mot d'antichambre vous a frappés", s'écrie Berryer. "M. de Montalembert a voulu combattre et flétrir les hommes qui voudraient que le gouvernement fût tout entier dans l'antichambre, là où ils adulent, où ils tendent la main, où ils mendient, où ils s'évertuent à porter des complaisances aussi fâcheuses pour celui qui les reçoit

¹ *Œuvres de Berryer*, plaidoyers, vol. III, p. 317.

² Une grande partie de cette lettre est citée par Maurice Sabatier, *Études et discours*, p. 235.

que honteuses pour celui qui les donne. Des antichambres, il y en a eu dans tous les temps et sous tous les régimes. Si je hantais les abords du palais où il y a des antichambres, j'y retrouverais toujours les mêmes hommes et les mêmes usages; c'étaient eux qui aux premiers jours de la Restauration se proclamaient les amants de la légitimité; qui, plus tard, à la Cour de la royauté de Juillet, venaient offrir de lâches services insolemment refusés par ceux-là mêmes auxquels on les offrait; ce sont ces mêmes hommes qui, toujours flattant, sollicitant, mendiant, quémandant, trafiquant de leur conscience pour obtenir un avancement dans leur carrière, en ont fait l'épreuve dès les premières années de ma jeunesse.

"Et c'est pour cela que je suis devenu un homme modéré, non pas modéré dans mes convictions, dans mon attachement à la monarchie et à la liberté, mais modéré dans ma conduite, modéré dans mon langage, comprenant que les autres n'aient pas les mêmes idées que moi, et respectant partout le courage et la dignité."

Et il termine en confondant sa cause avec celle de Montalembert: "Ah! messieurs, ne nous faites pas un crime de nos légitimes regrets. Nous vieillissons, nous n'avons plus qu'une chaleur qui s'éteint, laissez-nous mourir tranquilles et fidèles. Nous sommes assez malheureux de voir notre cause, notre sainte et glorieuse cause, trahie, vaincue, reniée, insultée; laissez-nous croire que nous pouvons lui garder au fond de nos cœurs un inviolable attachement; laissez-nous le penser, laissez-nous le dire! Laissez-nous garder et rappeler le souvenir de ces grands combats de la parole qui nous ont fait connaître, qui nous ont fait aimer les généreuses institutions que nous avons défendues, que nous défendrons toujours, et auxquelles nous serons fidèles jusqu'à notre dernière heure."¹

En dépit de ces éloquentes paroles—les meilleurs avocats ne gagnent point tous les procès dont ils se chargent — Montalembert fut condamné à six mois d'emprisonnement et à 3,000 francs d'amende. D'après la loi de sûreté générale, ce jugement le rendait passible d'expulsion et même de déportation. Et la phrase touchant le Canada, l'un des principaux chefs d'accusation, formait l'un des considérants du jugement qui déclarait Montalembert coupable de délit.

Celui-ci forma immédiatement appel de cette décision.

Quelle ne fut pas sa surprise de lire dans le *Moniteur*, journal officiel, que Sa Majesté l'Empereur avait, à l'occasion de l'anniversaire du 2 décembre, fait grâce à Montalembert de la peine prononcée contre lui!

¹ *Œuvres* de Berryer, op. cit., vol. III, pp. 328, 337.

Montalembert, furieux d'être gracié sans le vouloir, écrit aussitôt au rédacteur du *Moniteur*:

"Monsieur,

"Condamné le 24 novembre, j'ai interjeté appel de la sentence prononcée contre moi.

"Aucun pouvoir en France n'a eu jusqu'à présent le droit de faire remise d'une peine qui n'est pas définitive.

"Je suis de ceux qui croient encore au droit et qui n'acceptent pas de grâces."¹

Cette fierté fit se continuer le procès. L'audience de la Chambre des appels de police correctionnelle s'ouvrit le 21 décembre 1858.

Chaix d'Est Ange, procureur-général, et Roussel représentaient le ministère public. Montalembert était défendu par Berryer et Dufaure. Celui-ci prit le premier la parole:

"Au milieu de ce concert universel d'acclamations pour les bienfaits du pouvoir absolu, ne serait-il pas permis à un écrivain de dire les grandes choses que la liberté peut produire? Cet écrivain d'ailleurs n'aura-t-il pas dans sa situation personnelle quelque justification? S'il a pris part lui-même aux affaires politiques, s'il leur a consacré autrefois tous les efforts de sa plume et de sa parole, s'il a vécu soldat actif et vaillant du gouvernement parlementaire, en retrouvant les institutions, en les revoyant en action dans un pays voisin, il sentira revivre tous les souvenirs de sa jeunesse, et ses souvenirs deviendront facilement des regrets.

"Je ne voudrais rien dire contre mon cher et pauvre pays, mais nous avons, ce me semble, une étrange disposition. Les regrets qui s'attachent aux personnes, non seulement nous les souffrons, mais nous les honorons. Un homme aura suivi l'empereur Napoléon sur les champs de bataille de l'Europe, il aura avec lui combattu pendant vingt ans, il aura vaincu, il aura souffert avec lui et pour lui, et puis, pendant l'exil, après la mort, il se nourrira tristement des souvenirs que lui a laissés cette grande intelligence qu'il a eu l'honneur d'approcher; un ancien et fidèle serviteur aura vu un vieux roi à cheveux blancs, dont il avait admiré la dignité et éprouvé la bonté, tomber d'un trône glorieux pour prendre la route de l'exil, il conserve pour lui de respectueux et d'ineffaçables regrets; un autre aura assisté à l'intérieur d'une royale et auguste famille dans laquelle, comme le dit une simple et belle épitaphe inscrite sur le tombeau des Douglas à l'abbaye de Westminster, dans laquelle toutes les filles étaient

¹ *Œuvres* de Berryer, op. cit., vol. III, p. 340. On y lira aussi la lettre de Montalembert au cardinal Morlot, archevêque de Paris, qui, paraît-il, avait intercédé auprès de Napoléon III en faveur de Montalembert. Celui-ci protestait, en termes respectueux mais énergiques, contre cette sollicitude.

chastes et tous les fils étaient vaillants; il conservera leur souvenir pieusement et il ira mêler ses larmes à la douleur de ses deuils trop répétés. Je le dis à l'honneur de ce pays, de tous, pouvoir et citoyens, on respectera, on honorera de tels regrets. Pourquoi ne voulez-vous pas qu'il y ait quelque regret aussi pour des idées dont notre intelligence s'est nourrie, pour des institutions dont nous espérions voir sortir la grandeur de notre patrie ?

“Un homme est entré dans la vie publique à l'âge où, nous autres, nous cherchions laborieusement une profession. Il y est entré avec toutes les illusions et toutes les ardeurs de la jeunesse; il a eu le bonheur de prendre en mains, dès les premiers jours, une sainte et grande cause, et il l'a prise en mains avec une telle autorité que personne en France n'a pu lui contester le droit d'en porter le drapeau; il l'a défendue pendant vingt ans au milieu des luttes les plus vives; il a obtenu des succès personnels éclatants et, ce qui lui était bien plus précieux encore, des succès réels pour la cause qu'il défendait; et il a obtenu tout cela par la liberté de la discussion, de la tribune; je ne m'étonnerai vraiment pas, lorsque la tribune sera tombée, lorsque tout fera silence autour de lui, s'il va dans un pays voisin, et s'il assiste à l'un de ces grands drames de la libre discussion dans lesquels se succèdent les plus éminents orateurs d'un pays très éclairé, je ne m'étonnerai pas s'il s'anime avec eux, s'il se passionne avec eux.

“Il croira revoir ses rivaux, ses amis, ses combats d'autrefois; il éprouvera le besoin de dire, d'exprimer tout haut ses émotions. Son langage sera vif et coloré, et si, au milieu de ces expressions, quelques termes de comparaison avec des pays qui s'accommodent d'une autre vie lui échappent, vous ne saisirez pas ce mot au passage, vous n'oublierez pas l'impression générale d'un écrit de soixante-dix pages pour ne garder en mémoire qu'une phrase isolée, une expression trop vive, y voir un délit et le condamner.”¹

Berryer termine ce grand débat. “Ce qui a inspiré M. de Montalembert, dit-il, ce n'est pas une pensée d'attaque contre le gouvernement, c'est l'opposition d'une doctrine à une doctrine. On ne peut pas plus condamner un homme à oublier qu'à se taire; nous ne pouvons pas sortir de nous-mêmes, oublier notre intelligence et nos âmes; nous ne pouvons pas faire le sacrifice de notre être moral; nous sommes de cette génération qui a pris une trop grande part aux luttes de la liberté pour les dédaigner, et n'y voir que les vains et inutiles efforts de l'amour-propre, les débats de l'orgueil et de l'ambition.”

“Vous voulez, continue Berryer, que nous soyons infidèles à la France parce qu'elle a trahi notre confiance? Vous voulez que nous

¹ Cité par Georges Picot, dans son article sur Dufaure publié dans la *Revue des deux mondes*, 1882, L IIe année, 3ème période, vol. 52, pp. 13 et 14.

ne regrettions pas la liberté dont nous nous sommes fait gloire, pour laquelle nous avons tant combattu ? Non, jamais nous n'obéirons à cette injonction ; jamais nous ne regarderons comme un jugement qui déshonore le jugement qui condamnera un homme parce qu'il a été fidèle aux doctrines de toute sa vie, parce qu'il a défendu ce qui est dans la conscience, dans les besoins, dans les nécessités, dans les invocations, dans les aspirations de son pays."¹

Quels avocats ! Mais aussi, quel client !

Berryer, en cherchant à diminuer l'effet d'un jugement qui condamnerait Montalembert, avait lu dans l'esprit de ses juges. Le double effort oratoire de Dufaure et de Berryer produisit certain résultat, mais ne parvint pas cependant à faire libérer l'accusé.

La Chambre des appels confirma le jugement tout en le modifiant. S'appuyant elle aussi spécialement sur le passage touchant le Canada, elle maintint la condamnation à l'amende de 3,000 francs, mais réduisit à trois mois l'emprisonnement,—de six qu'il devait être.

Napoléon III, qui y tenait évidemment, revint à la charge, fit de nouveau grâce au condamné. Celui-ci, ne pouvant plus exercer de pourvoi en cassation, pris entre la prison et la miséricorde de l'Empereur, se laissa faire et opta pour celle-ci. Mais cette faveur impériale, qu'il se voyait imposer, dut être, pour son âme libre et fière, la plus douloureuse épreuve de ce procès retentissant qui lui valut de si multiples ennuis.

Et voilà comment les tribunaux de France furent amenés, sous le second Empire, à s'occuper—oh ! bien indirectement—du Canada.

On aime à se représenter le spectacle qu'offrait cette audience. Elle se tint, raconte la chronique judiciaire, sous les voûtes surbaissées et sombres de l'ancienne Chambre des appels correctionnels.

L'assistance est nombreuse. L'événement attire tout Paris, ce tout Paris des grandes audiences correctionnelles de tous les temps. Au dire de Maurice Sabatier, il "comprend des hommes politiques, des académiciens, des actrices, des avocats et . . . quelques repris de justice."

Cette fois l'on aperçoit, au premier rang, Villemain, le duc de Broglie, Odilon Barrot, Lord Howden, de Falloux, Guizot. Ils s'intéressent à l'accusé, collègue des uns, ami des autres, supérieur à tous. Ses avocats sont les maîtres du Barreau.

Quelle impression fit sur cette assemblée d'élite l'évocation du Canada ? Quelles idées, quels sentiments éveilla, dans ces esprits ouverts et ces cœurs si français, le souvenir des liens qui jadis avaient uni à leur patrie cette terre lointaine ? Furent-ils heureux ou tristes

¹ *Œuvres* de Berryer, op. cit., vol. III, pp. 376, 377.

en entendant Berryer justifier Montalembert d'avoir écrit que ce pays abandonné par leurs ancêtres jouissait, sous la loi du conquérant, des libertés que la France n'avait pas su garder pour elle ?

En Cour de première instance, Berryer, pour repousser l'accusation tirée contre son client de la phrase écrite à notre sujet, se contenta de dire que l'observation était vraie et que les lois municipales de la France en 1858 étaient moins libérales que celles de l'ancien régime.

Devant la Chambre des appels, il alla un peu plus loin. Reprenant le passage sur le Canada, il déclare que Montalembert a simplement dit "qu'après la conquête du Canada, l'Angleterre a respecté les anciennes libertés municipales établies par la France dans ce pays dont le cœur est encore tout français." Et Berryer ajoute: "Regretter la répudiation par la France de libertés conservées au Canada, c'est là faire un rapprochement historique, c'est constater un fait moral et d'ailleurs incontestable; ce n'est pas une injure."¹

Ainsi donc, pour une fois, avocat et client sont d'accord et, en l'occurrence, ils pensent de même à propos de notre pays. Parvinrent-ils à convaincre leurs auditeurs ?

Et nous ? A cinquante ans de distance, s'il nous fallait justifier Montalembert de son article, ferions-nous nôtre le plaidoyer de son avocat ? Le pourrait-on pleinement approuver du jugement qu'il venait de porter sur le Canada ? Son opinion était-elle juste ou exagérée ?

Rappelons-nous ces quelques phrases de Montalembert.

"Au Canada, a-t-il écrit, une noble race française et catholique, arrachée malheureusement à notre pays, mais restée française par le cœur et par les mœurs, doit à l'Angleterre d'avoir conservé, ou acquis, avec une entière liberté religieuse, toutes les libertés politiques et municipales que la France a répudiées; elle a vu sa population décuplée en moins d'un siècle, et va servir de base à la nouvelle fédération qui, des bouches de l'Orégon à celles du Saint-Laurent, sera un jour la rivale ou la compagne de la grande fédération américaine."

Laissons de côté ce qui, dans ce passage, concerne la France. Montalembert ne fait que répéter, à ce sujet, l'opinion qu'il avait émise, quatre ans auparavant, dans sa lettre à P.-J.-O. Chauveau, dont nous avons parlé il y a quelques instants. Il lui écrivait: "Conservez-moi, je vous en prie, le bienveillant souvenir dont vous m'honorez. J'irai peut-être un jour vous en remercier de vive voix, car j'éprouve depuis longtemps le vif désir de visiter les États-Unis et le Canada. Je sais que je retrouverai dans votre pays une image

¹ *Œuvres* de Berryer, op. cit., vol. III, pp. 329, 373.

fidèle de la vieille France dans ce qu'elle avait de plus recommandable. La Providence, en vous détachant, il y a un siècle, de la mère-patrie, vous a préservés des honteuses alternatives d'anarchie et de despotisme où elle se débat depuis si longtemps et dont elle ne paraît guère disposée à sortir."

Il resterait à rechercher si les libertés dont nous jouissions en 1858 ressemblaient à celles de la France de l'ancien régime. La France était-elle moins libre sous Napoléon III que sous Louis XIV? Il serait intéressant, à ce sujet, de lire, en regard les unes des autres, certaines pages des *Origines de la France contemporaine* de Taine et de l'*Empire libéral* d'Emile Olivier.

Bornons-nous à étudier ici la pensée de Montalembert en ce qu'elle touche au Canada.

Deux ou trois phrases ont donc suffi à l'auteur pour rappeler le passé du Canada, juger sa condition présente, prédire son avenir. Après avoir déploré que ce rameau vigoureux ait été jadis coupé du vieux tronc français; après avoir annoncé la future confédération qui, assise sur le roc solide de la race française, fera des provinces canadiennes des États aussi grands que les États-Unis, Montalembert justifie tant d'espairs en invoquant le présent. Cette race, la nôtre, a su demeurer, de cœur et de mœurs, fidèle à ses traditions. C'est qu'elle est mue par cette puissance du caractère qui, aux peuples comme aux individus, assure les triomphes et la durée. Elle croît sans cesse en nombre. C'est que, gardant intacte sa moralité, elle entretient des sources de vie que ne sauraient tarir ni les persécutions, ni les difficultés, ni les blessures.

Si les observations de Montalembert se fussent arrêtées à ce point, il n'y aurait rien à y reprendre. Mais il a garde d'oublier la thèse qu'il soutient: recul de la France sur le terrain des libertés et supériorité de l'Angleterre dans le maniement des colonies. Il continue donc sa démonstration et affirme que cette race "doit à l'Angleterre d'avoir *conservé* ou *acquis*, avec une entière liberté religieuse, toutes les libertés politiques et municipales que la France a répudiées."

Montalembert aborde ici, pour le résoudre sans la moindre hésitation, un problème sur lequel, chez nous, l'accord des esprits ne s'est pas encore fait. Les uns sont des victimes du mirage; les joies présentes leur font oublier les difficultés de la veille, la quiétude de la maturité les luites de la jeunesse. Ils s'en vont répétant que, les libertés dont profite le Canada en l'an 1916, l'Angleterre les lui a volontairement octroyées. Elle y était poussée, disent-ils, par sa générosité instinctive. Son génie politique de bonne heure lui aurait enseigné que le vainqueur doit laisser au vaincu sa religion, ses lois,

sa langue, s'il ne veut point en faire un rebelle. D'autres, à la lumière de l'histoire impartialement étudiée, affirment que l'Angleterre n'a point mis cette spontanéité dans la concession du régime, plus large, plus souple, plus respectueux des coutumes locales, sous lequel se meut notre pays.

Il n'est guère possible de douter aujourd'hui que ce sont ces derniers qui ont raison. Des faits multiples prouvent qu'après 1760 nos ancêtres durent gagner de haute lutte les avantages dont nous jouissons maintenant. Le gouvernement de la métropole n'adopta à notre égard une façon d'agir moins rigide que parce que le maintien d'une politique de rigueur menaçait de tout perdre. Aucune de nos libertés n'échappe à cette conclusion, ni les municipales, ni les constitutionnelles, ni même les libertés religieuses.

Tout récemment encore M. l'abbé Lionel Groulx rappelait, en des pages faites de clarté et d'érudition, que "la liberté chez nous ne fut pas un don mais une conquête": "Nos libertés constitutionnelles furent des conquêtes exclusivement canadiennes où nos ancêtres ont tenu le grand rôle; et, si notre autonomie ne fut pas conquise sur les champs de bataille, le terme *conquête* reste tout de même le terme propre qu'il importe de dire quand nous parlons de nos libertés."¹

Si d'aucuns reconnaissent la justesse de cette observation quand elle s'applique aux libertés constitutionnelles, ils la nient dès qu'on veut y soumettre aussi les libertés religieuses.

Montalembert aurait-il du moins raison sur ce sujet? Serait-il vrai de dire que nous devons à l'Angleterre d'avoir "conservé une entière liberté religieuse"? Il semble bien que non.

Les luttes qui se livrèrent chez nous pour la conquête de la liberté religieuse, par cela qu'elles furent moins violentes, moins généralisées, moins longues que les autres, apparaissent voilées aux esprits superficiels.

Pourtant, elles furent réelles. Feu le Juge Pagnuelo qui, vers 1872, publia tout un livre afin de démontrer qu'au temps où il écrivait la liberté religieuse était chez nous entière, n'en avouait pas moins "les prétentions de la Couronne britannique sur l'Église Romaine en Canada" et les luttes que l'Église dut subir pendant près de 60 ans avant de sortir de ce combat libre et indépendante.² En pourrions-nous, du reste, douter?

¹ Cinq conférences prononcées à l'Université Laval à Montréal de novembre 1915 à avril 1916; spécialement celles du 19 janvier 1916, p. 7, et du 12 avril 1916, p. 21.

² Pagnuelo, *La liberté religieuse en Canada*, Introduction, p. VII.

Si les capitulations de Québec (art. VI) et de Montréal (art. XXVII et sq.) assuraient "le libre exercice de la religion catholique", le traité de Paris du 10 février 1763 contenait cette phrase énigmatique: "La liberté de la religion catholique est accordée aux habitants du Canada autant que les lois d'Angleterre le permettent." Puis, l'acte de Québec de 1774 (art. V) assurait la liberté de l'exercice de la religion catholique, mais "soumise à la suprématie du Roi, déclarée et établie par un *Acte* fait dans la 1ère année du règne de la reine Elizabeth."

L'Acte d'Union de 1840 ne changeait guère la situation. Il laissait subsister ce qui lui était antérieur, relativement au culte de l'Église catholique, et ainsi il tendait plutôt à maintenir la sujétion de la religion catholique à la suprématie du Roi.

Mais ce dont il faut surtout se souvenir, c'est de la malveillance et du fanatisme des agents du nouveau pouvoir. Ils cherchèrent, dès l'origine de la domination anglaise, à susciter des entraves à la religion catholique, et ce au profit de l'Église anglicane. Il semble bien aussi que, durant de longues années, le gouvernement de la métropole reçut avec faveur les plans que ses fonctionnaires canadiens lui soumièrent pour opprimer la religion tout comme la langue des vieux colons français du Canada. De cela les instructions royales aux gouverneurs nous apportent des preuves abondantes.

En 1824, le gouverneur Dalhousie écrivait aux ministres anglais à Londres qu'il fallait remédier à un abus: le pouvoir indépendant de l'évêque catholique. Et, dans une audience qu'il eut en janvier 1820 avec le pape Pie VII, Mgr. Plessis, qui venait d'être nommé archevêque, demandait à Sa Sainteté la permission de ne pas prendre ce titre d'archevêque tant que le gouvernement anglais s'y montrerait opposé.

Ce fut bien aussi pour ne point mécontenter ce même gouvernement de la métropole qu'on nomma Mgr. Lartigue simplement auxiliaire et suffragant de l'évêque de Québec et qu'il ne lui fut pas permis tout d'abord d'assumer le titre d'évêque diocésain.

Notre histoire révèle ainsi, à chaque page, les prétentions de la Couronne britannique sur l'Église romaine en Canada, relativement à l'érection d'évêchés, à la nomination des évêques, à l'érection des paroisses, à la nomination des curés. Ces tracasseries, comme celles que l'on nous fit sur le terrain politique, empêchèrent de se répandre ici la vie pleine et large de l'homme libre.

Si donc le terme *conquête* convient à toutes nos libertés—religieuses ou constitutionnelles—Montalembert eut tort d'écrire que nous devions à l'Angleterre de les avoir conservées ou acquises. Le peuple qui, par la ténacité de sa lutte, arrache au vainqueur le droit

à sa religion, à sa langue et à ses lois, ne lui doit rien. Les expressions *conservé* et *acquis*, employées par Montalembert, se trouvent être inexactes et son observation, à ce sujet, est contraire à la vérité historique.

Comment expliquer pareil optimisme chez un écrivain qui donna de multiples années de sa vie à l'étude de l'histoire et qui en connaissait si bien toutes les exigences ?

Montalembert ne devait pas être ignorant des choses canadiennes. J'en trouverais au besoin une preuve dans l'intérêt que le *Correspondant*—dont il fut un temps l'âme dirigeante—témoignait à l'égard de notre pays. En 1853, cette revue faisait une critique de l'inexacte histoire que le fameux abbé Brasseur venait de composer, "Le Canada, son Église et ses missions." La même année, elle signalait la publication de la première partie du grand ouvrage de Garneau, l'histoire du Canada.¹ En 1859, le *Correspondant* devait publier un article intéressant sur "Lord Elgin au Canada."² Il est permis de supposer que Montalembert n'était pas étranger à toutes ces études que contiennent les livraisons du *Correspondant* de ce temps. Comment se méprit-il à notre sujet ?

Certes, en écrivant ses phrases touchant le Canada, il avait le souci de l'anthithèse. Il voulait démontrer la supériorité du régime politique de l'Angleterre sur celui de la France, et la situation incomparable de l'Angleterre comme nation colonisatrice. Mais le désir de l'antithèse—qui pourtant joue de vilains tours à maints écrivains—n'aurait sans doute jamais été assez violent, chez un homme de la sincérité de Montalembert, pour lui faire volontairement voiler les connaissances qu'il pouvait posséder à notre sujet. Sa bonne foi mise hors de doute, une explication peut être donnée.

En 1858, il y avait au Canada accalmie. La fumée de 1837 s'était dissipée, surtout après l'adoption de la loi de sir Louis Hyppolite Lafontaine par laquelle l'on indemnisait les victimes de ces temps troublés. En 1858, près de 10 ans s'étaient écoulés depuis que les tories—les Allemands de ce temps-là—avaient incendié le parlement de Montréal, insulté lord Elgin, attenté aux jours de Lafontaine. La paix paraissait conclue pour de bon. L'Union—destinée à nous anéantir—nous avait valu toutes nos libertés : la langue française en 1845-1848, la loi scolaire en 1846, la loi des corps municipaux en 1845, la responsabilité ministérielle le 11 mars 1848, la liberté des cultes en 1851.

¹ Le *Correspondant*, vol. 33, pp. 90 et 343 (1853-1854).

² Le *Correspondant*, vol. 46 de la collection, pp. 476 et sq., article signé Arthur Dudley (Madame Blaze de Bury).

Toutes les libertés se tiennent: la première une fois conquise devait entraîner les autres à sa suite. Et l'on a pu dire que l'Église anglicane, qui avait toujours été chez nous soutenue par la Couronne et qui fut au fond de la lutte que l'Église Catholique eut à soutenir ici, l'Église anglicane dut abandonner ses prétentions à être reconnue comme religion d'État le jour où nous eûmes conquis le gouvernement responsable, c'est-à-dire la dépendance des chefs politiques à l'égard de la majorité des représentants. Infime minorité dans le Canada-Uni, l'Église anglicane ne pouvait plus prétendre imposer ses vues.

Ces gains précieux, qu'en l'année 1858 nous avions à notre crédit, Montalembert dut les connaître. Au cours des visites qu'il faisait à Londres, il fréquentait chez les maîtres de la politique anglaise, ses amis: lord Palmerston, lord Aberdeen, Robert Peel, Gladstone, Macaulay. La politique de l'Angleterre faisait sans doute l'objet de leurs conversations et, au chapitre des relations de la métropole avec ses possessions d'outre-mer, Montalembert devait, de préférence, s'arrêter au Canada. Comme, à cette époque, les hommes d'État anglais songeaient enfin à faire plus large en faveur des colonies la concession des libertés politiques et à leur octroyer l'autonomie convenable aux peuples qui ont grandi, Montalembert ne pouvait qu'admirer sans réserve les perspectives brillantes que ses interlocuteurs lui faisaient apercevoir à l'horizon des colonies anglaises. Loin du théâtre où grandissaient ces nations nouvelles, tout à la joie d'acclamer ces libertés de l'heure présente, il oublia les luttes, longues et pénibles, par lesquelles elles avaient été gagnées.

Nous aurions mauvaise grâce à lui en tenir rigueur: tant de Canadiens se sont rendus coupables de semblable oubli!

Ce qu'il y a d'étonnant, c'est que son enthousiasme lui ait non seulement caché notre situation exacte, mais qu'il ait aussi voilé sa connaissance de la psychologie des peuples.

Lui qui, toute sa vie, avait été l'apôtre des faibles et des petits; lui dont l'existence avait eu pour but unique la défense des opprimés, comment ne s'est-il pas souvenu de l'attitude menaçante que le grand nombre garde toujours à l'égard des minorités? Pourquoi oublia-t-il cette loi, vieille comme le monde, qu'aux yeux du fort le faible reste le faible, et que la puissance du premier cherche sans cesse à écraser la faiblesse du second?

Ce que l'on pourrait reprocher, avec le plus de raison à Montalembert, c'est d'avoir enveloppé ces quelques phrases d'un tel air de quiétude. Il laissait croire que jamais plus la race française n'aurait à craindre, sur terre canadienne, pour la sauvegarde de ses droits.

Force nous est pourtant de reconnaître qu'il n'y eut point d'exception en faveur des Canadiens français. Aujourd'hui comme autrefois, il leur faut se défendre contre certaines formes d'empiètement du vainqueur. La lutte n'était pas finie en 1858; elle ne l'est pas encore; elle ne le sera point d'ici longtemps. Maintes gens au Canada ne perdent pas une occasion de nous rappeler que nous sommes toujours les vaincus de 1760 et qu'un siècle et demi d'attitude loyale et digne ne suffit point pour acquérir ici droit de cité. A aucune période de notre histoire, pas plus en 1760 qu'en 1837, pas plus en 1858 qu'en 1916, il ne nous a été permis de nous endormir dans une fausse sécurité. Notre mot d'ordre n'a jamais cessé d'être, et il est encore, de lutter, de défendre, contre tous les assauts, les notes caractéristiques de notre race, et d'assurer ainsi sa survivance catholique et française.

Si c'est bien là la leçon qu'il importe d'inculquer aux générations montantes, souhaitons que, pour soutenir ces difficiles combats, notre race trouve, comme ses interprètes, quelques âmes d'élite, capables de reproduire dans leur vie l'intelligence si largement ouverte, le cœur si haut placé, l'ardeur, le désintéressement de l'homme admirable dont nous avons voulu rappeler le souvenir.

*Les tribunaux et les officiers de justice, à Montréal, sous le régime français
1648-1760.*

PAR E.-Z. MASSICOTTE

Présenté par BENJAMIN SULTE, LL.D., M.S.R.C.

(Lu à la réunion de mai, 1916.)

Au cours de nos travaux dans les archives judiciaires de Montréal, nous avons recueilli les noms de divers officiers de justice sous le régime français et nous en avons dressé la liste dans le but de procurer aux historiens un tableau d'une consultation facile.

Notre relevé se divise en trois parties: la première comprend la justice seigneuriale; la deuxième, la première justice royale et la troisième, la seconde justice royale.

I.

JUSTICE SEIGNEURIALE.

1648-1693.

Par leur acte de concession, les seigneurs de l'île de Montréal avaient droit de justice haute, moyenne et basse.

Aucun tribunal, cependant, ne semble avoir existé, en ce lieu, avant l'année 1648.

A son retour de France, en 1647, M. de Maisonneuve apportait l'ordre de commencer l'établissement effectif de Villemarie.

Notre gouverneur, se conformant aux instructions reçues, distribua des terres aux colons¹ et instaura un système judiciaire et civil qui fonctionna régulièrement à partir de janvier 1648.²

Le tribunal consistait en un juge et un commis au greffe et tabelionnage. Ce dernier agissait, à la fois, comme greffier du tribunal, comme notaire, dans l'étendue de la seigneurie, puis, au besoin, comme huissier, arpenteur et secrétaire de la fabrique.³

¹ Massicotte, *Les premières concessions à Montréal, Mémoires de la Société Royale*, 1914, p. 215.

² Massicotte, *Les actes des premiers tabellions de Montréal, Mémoires de la Société Royale*, 1915, p. 189.

³ Jean de St-Père fait un exploit d'huissier le 25 sept., 1656. Bénigne Basset cumula toutes les fonctions ci-dessus énumérées.

Vers le même temps, on dut faire la première élection de syndic de la communauté et probablement, plus tard, on ajouta un procureur fiscal, un substitut au procureur fiscal et des juges de police. Ces derniers ne furent en réalité que des fonctionnaires civils et nous les plaçons dans une liste qui paraîtra ultérieurement.

Ainsi qu'on le verra ci-après, le Conseil souverain essaya de supplanter la justice seigneuriale, en 1663, et un premier tribunal royal fonctionna, pendant quelque temps, concurremment avec le tribunal seigneurial, mais il fallut l'abolir après trois ans d'existence.

La justice des Seigneurs n'eut d'abord juridiction que dans l'île de Montréal, mais en 1683, le 23 février, (archives judiciaires) le R. P. Raffeix, procureur des Pères de la Compagnie de Jésus, ayant exposé qu'il n'y avait pas de tribunal à Laprairie et que la plus proche justice royale était à 30 lieues, c'est-à-dire aux Trois-Rivières, demanda et obtint de faire assigner les débiteurs de Laprairie devant la justice de Montréal.

Cela lui fut accordé avec la condition que les appels iraient aux Trois-Rivières.

L'accroissement de la population autour de l'île de Montréal provoquait l'extension de la juridiction de la justice seigneuriale et l'acheminait fatalement à une transformation. C'est ce qui se produisit en 1693, alors que, d'accord avec les Seigneurs, le roi abolit la justice seigneuriale par un édit du 15 mars et donna une juridiction et des pouvoirs plus étendus à la nouvelle justice royale.

JUGES, DÉNOMMÉS BAILLIS,¹ LIEUTENANTS CIVILS ET CRIMINELS.

1° Paul de Chomedey, sieur de Maisonneuve, 1648-1663. Dernière sentence: 11 août 1663.

2° Charles Dailleboust, sieur des Musseaux, 1663-1677. Dans un acte de Basset (18 nov. 1663), il porte les titres de "lieutenant de la garnison et juge de la juridiction des seigneurs."

M. de Maisonneuve avait été forcé d'abandonner ses fonctions judiciaires à cause du conflit qui venait de surgir au sujet de la justice, à Montréal (1663), entre les seigneurs et le Conseil souverain.

Le 27 septembre 1666, après l'abolition de la première justice royale, M. Dailleboust fut renommé par l'abbé Souart et Zacharie Dupuis, alors commandant de Montréal, l'assermenta le 25 janvier 1667. En cette année, M. Dailleboust se désigne: "Juge civil et criminel de la terre et seigneurie de Montréal" puis, en 1668, il prend le titre de "bailli, juge civil et criminel."

¹ C'est-à-dire, juges dans un bailliage.

M. Dailleboust fut remercié en 1677 et il en appela au Conseil souverain, mais sans succès.¹

3° Jean-Baptiste Migeon de Branssat, 1677-1690. Nommé le 26 août 1677, il entre en fonction le 30 septembre en prononçant une allocution, établissant une coutume que suivent ses successeurs.² Il donna sa démission en 1690.

4° Joseph-Alexis de Fleury Deschambault, nommé au mois d'août 1690 par l'abbé Dollier de Casson, vit sa nomination confirmée, quelque temps après, par l'intendant Bochart de Champigny. Il prit possession de sa charge le 21 novembre 1690 en prononçant une allocution et en produisant tous les documents relatifs à sa nomination. Lors de l'abolition de la justice seigneuriale en 1693, il devint procureur du roi dans la nouvelle justice royale.

JUGES INTÉRIMAIRES.

De 1648 à 1693, les juges s'absentent souvent ou se refusent et ils se font remplacer par un officier de la garnison, par un substitut du procureur fiscal, ou par un simple huissier.

En voici la liste :

Lambert Closse, 1er juin 1657.

Zacharie Dupuis, 10 septembre 1662 et 19 octobre 1663.

Jean Gervaise, 26 septembre 1673 (Baſset), puis de 1674 à 1689, il occupe le siège à maintes reprises.

Mathieu Hubou des Longchamps, 28 septembre, 1677.

Jean Petit de Boismorel, huissier et substitut du procureur fiscal, 1678, 1679 et 1689.

François Bailly dit Lafleur, huissier, 1681 et 1683.

Claude Mauge, février 1689, (Jug. et dél. du C. S., III, 296).

Hilaire Bourguine, greffier, notaire et procureur fiscal, 1690.

J. B. Pottier, substitut du procureur fiscal, 1690, 1691 et 1692.

François Lory, huissier, 1691.

Pierre Cabazié, huissier, 1691.

Jean Quesneville, huissier, 1691, 1692 et 1693.

Georges Pruneau, commis greffier, 1692.

PROCUREURS FISCAUX.

Dans la justice seigneuriale, le procureur fiscal remplissait une charge équivalente à celle de procureur du roi, dans la justice royale. On trouve la définition de cette charge dans Faillon, *H. de la col.* III, 360, Doutre et Lareau, *Hist. du droit*, 135 et 226, et Jug. et délib. du C. S. I, 808.

¹ Voir *Bulletin des Recherches Historiques*, 1915, p. 234.

² Voir *Bulletin des Recherches Historiques*, 1915, p. 232 et 303.

1° Gilbert Barbier, mentionné dans un acte de Basset du 7 nov. 1657. Il occupait encore en 1662.

2° J. B. Mignon, 1663 à 1664.¹

3° J. B. Migeon de Branssat, 1667 à 1677, alors qu'il devient juge.

4° Mathieu Hubou des Longchamps. Il commence à exercer sa charge le 3 avril 1677, bien qu'il ne soit nommé officiellement que le 26 août suivant. Il cesse de pratiquer après le 23 février 1678 et il est inhumé, le 2 novembre de la même année, à la Pointe-aux-Trembles. Il ne fut remplacé qu'en 1688.

5° Hilaire Bourguine. Il commence l'exercice de sa charge le 27 janvier 1688 et le 12 mai 1690, le juge Migeon de Branssat l'interdit pour outrage, rebellion et attentat à sa personne.

SUBSTITUTS DES PROCUREURS FISCAUX.

En son absence, le procureur fiscal était remplacé par un substitut et si celui-ci manquait, on recourait à un subdélégué du substitut.

Jean Gervaise, 1673 (Basset, 26 sept.) à 1688. Il est inhumé le 12 mars 1690 âgé de 69 ans. Tanguay, I, 265, dit qu'il fut procureur fiscal, ce qui est inexact. En réalité, il occupa comme procureur fiscal fort longtemps, mais il n'eut jamais d'autre titre que celui de substitut. Ajoutons, qu'un document, du 21 juin 1660, nous informe qu'il était alors, "commis à la recepte des amendes de Villemarie."

François Bailly, dit Lafleur, huissier, en février et mars 1678, 1681, 1683, 1686, 1687. Il se désigne comme suit, tour à tour: "substitut délégué de M. le procureur fiscal," "vice-gérant de M. le substitut," "subdélégué de M. le substitut."

Jean Petit Boismorel. En septembre 1678, en mars 1680 et en septembre 1682.

J. B. Pottier, notaire. Du 20 juin 1690 au 5 mai 1693. A cette dernière date, le curé Rémy, de Lachine, porte contre Pottier une plainte pour injures et menaces à sa personne, et Pottier ne paraît plus.

Pierre Cabazié. Il remplace le substitut Pottier qui ne peut plus occuper, en mai et juin 1693.

GREFFIERS.

1° Jean de Saint-Père, depuis janvier 1648 à juillet 1651, ensuite du 10 avril 1655 à son assassinat, en octobre 1657.

2° Raphaël-Lambert Closse, depuis juillet à décembre 1651 et de décembre 1653 à avril 1655.

¹ Au sujet de Mignon et de Migeon, voir notre article dans le *Bulletin des Recherches Historiques*, 1915, p. 232.

3° Nicolas Gastineau-Duplessis, depuis janvier 1652 à juillet 1653.

4° Bénigne Basset, d'octobre 1657 à octobre 1677. Il est possible que le renvoi de Basset soit dû à M. Migeon de Branssat, car ce dernier témoigne en plusieurs endroits qu'il trouvait Basset peu soigneux.¹

5° Claude Mauge, nommé le 23 novembre 1677, démissionne en décembre 1684.

6° Hilaire Bourguine de décembre 1684 au mois de mai 1687. Le 9 mai 1687, M. Migeon de Branssat se rend chez Bourguine pour obtenir remise des documents judiciaires. Il n'y trouve que le commis de Bourguine, M. Bouassier. Ce dernier livre la clef de l'armoire où sont les documents qui sont emportés par Adhémar et son commis Cabazié.

7° Ant. Adhémar de Saint-Martin, de mai 1687 au mois de novembre 1693, alors qu'il devient greffier de la justice royale.

GREFFIERS INTÉRIMAIRES ET COMMIS GREFFIERS.

Isaac Dodin, 9 juin 1665.²

Jacques Bourdon, 7 décembre 1666. Il était alors sergent ou huissier. Plus tard, il sera notaire.

F. Denison, 29 juin 1668.³ Le 8 et le 24 septembre 1674, il est témoin dans des actes dressés par René Oudain, notaire de la seigneurie de Verchères.

François Bailly dit Lafleur, huissier, 1674, 1678 et 1680.

Pierre Cabazié, huissier, 1674 à 1678, 1680 à 1691.

G. Bouassier, commis au greffe, d'octobre 1686 à avril 1687.

Jean Quesnevillé, huissier, 26 novembre 1686, 4 octobre 1687, 4 juillet 1692.

B. T. Bourgonnière de Hauteville, commis-greffier. Il signe: Bourgonnière, 1687, 1688, 1689, 1691, 1692. Il agit aussi comme procureur. D'après Tanguay, I, 80, ce serait lui qui devint secrétaire du gouverneur Frontenac.

E. Courbet, 3 et 4 juillet 1687.

(A ?). Mesnard, clerc, 13 au 16 septembre 1687.

Julien Beaussault, commis au greffe. 1 et 6 juillet 1688. Tanguay, I, 35, dit qu'il demeurerait avec le curé Germain Morin, à Ste-Anne de Beaupré, en 1690. Il note, en plus, avec raison, qu'il avait une écriture remarquable.

¹ Registre du tabellionage, au mois de décembre, 1677, archives de Montréal.

² Massicotte, *Colons de Montréal, Mémoires Société Royale*, 1913, n° 885.

³ *Ibid*, n° 1319.

J.-B. de Lamare, commis au greffe, d'avril 1688 à mars 1689. Il était âgé de 20 ans et demeurait chez le greffier et notaire Ant. Adhémar.

G. Michellet, commis au greffe, de février 1689 à juillet 1692.

C. Duplessis, commis au greffe, 2 mars 1689.

Pierre Cornillier, huissier, mars 1689.

De la Faye (Antoine?), commis au greffe, novembre 1689.

Georges Pruneau, commis au greffe, mai 1690 à novembre 1693.

HUISSIERS ET SERGENTS DU BAILLIAGE.

Durant la justice seigneuriale, les sergents ou huissiers sont pour la plupart immatriculés à Montréal et attachés au bailliage; il existe aussi quelques sergents royaux. Il semble que ce n'est qu'après l'établissement de la première justice royale (1663-1666) que les seigneurs nommèrent des huissiers pour leur bailliage.

1° Le premier sergent qui figure dans les documents est Pierre Raguideau, mais comme il faisait partie de la justice royale de 1663-66, nous en parlerons dans la seconde partie de ce travail.

2° Jacques Bourdon est "sergent de la seigneurie et isle de Montréal de l'automne de 1666 au mois d'août 1667." A cette date, il est interdit par le juge Dailleboust. Plus tard, il devint notaire royal tout en restant huissier. (Document du 22 août 1682).

3° François Bailly dit Lafleur, ancien maçon, apparaît comme sergent au bailliage, le 25 février 1667 et il continua de pratiquer sa profession jusqu'à son décès, en juillet 1690. A l'occasion, il fut substitué du procureur fiscal puis, en 1676, le 2 juillet, il devint sergent royal, géolier et concierge de la prison.

4° Pierre Cabazié, sergent au bailliage dès 1673, devint sergent royal au mois d'octobre 1674, fut renommé en juillet 1676, puis en novembre 1693. Dans son premier volume, Tanguay le fait mourir en 1691, alors que c'est son fils Pierre, âgé de 19 ans qui fut tué au combat de Laprairie. Cabazié (c'est ainsi qu'il signe) après avoir été commis au greffe, procureur en justice et notaire, fut inhumé le 14 juillet 1715, âgé de 74 ans.

5° Jean Roy, arrivé à Montréal avec sa femme Françoise Buet en 1657, ne semble avoir pratiqué qu'en 1675 et 1676. Il est inhumé à Lachine, le 1er novembre 1676.

6° Denis Marseau, juillet 1680.

7° André Hachin (Achin) dit Saint-André, juillet 1680 à 1681. En avril 1692, il était "laboureur, âgé de 49 ans" et demeurait rue Saint-François.

8° François Lorry. D'abord huissier au Cap de la Madeleine (1677), il devient sergent du bailliage de Montréal en 1682 et pratique jusqu'en 1693, alors qu'il est nommé sergent royal. Sépulture, à Lachine, 6 janvier 1702.

9° Jean Quesneville, immatriculé au bailliage de Montréal dès juillet 1681. Il devint géolier et concierge de la prison, en 1690, tout en continuant de pratiquer comme huissier.

10° Jean Petit Boismorel. Après avoir été substitut du procureur fiscal, il devint sergent royal en 1682. Plus tard, il se dit immatriculé aux Trois-Rivières et résidant à Montréal. En 1688, il est huissier en la "maréchaussée royale de la Nouvelle-France."

Enfin, en 1689, on le désigne comme archer de la maréchaussée de la Nouvelle-France. Il pratiquait encore à Montréal, en 1693.

11° Georges Pruneau, huissier royal, 17 avril 1683, âgé de 23 ans. Il pratiquait encore en 1693.

12° Gilles Carré. "Maître ciergier" en 1682. Ne semble avoir été huissier que d'avril à juillet 1683.

13° Michel Moreau, huissier à Boucherville, 11 mai 1686 et 12 septembre 1693. Voir la liste des notaires.

14° Louis Gillet, huissier du bailliage, 1687 et 1688.

15° Pierre Cornillier dit Grandchamp, 1688 et 1689.

16° René-Antoine de la Faye, huissier du bailliage, 4 novembre 1689 et 1690.

17° Nicolas Lemoyne, 1691 et 1692. Il était âgé de 50 ans en cette dernière année.

18° Antoine Hatanville, 24 mars 1692. L'année suivante, il était fermier des droits seigneuriaux.

GÉOLIERS ET CONCIERGES DE LA PRISON DE MONTRÉAL.

Denis Marseau, 1679.

François Bailly dit Lafleur, 1682, 1683.

Pierre Cabazié, 16 mai 1683.

Jean Quesneville, du 25 juillet 1690 à 1693.

ASSESEURS.

Dans certains procès criminels importants, le tribunal s'adjoignait des conseils ou des *assesseurs* qui, après l'audition ou l'étude des témoignages, donnaient leur avis au juge sur la culpabilité des accusés et le châtimement à être infligé. Il y eut plusieurs de ces cas sous la justice royale, mais nous n'en trouvons qu'un seul sous la justice seigneuriale.

En cette circonstance (avril 1667), les assesseurs furent Jacques Leber, Jacques Lemoyne de Ste-Marie, Nicolas de Mouchy, ex-greffier de la justice royale, Louis Prud'homme, Pierre Picoté de Belestre, Louis Artus de Sailly, ex-juge de la sénéchaussée.

INTERPRÈTES.

Jean Quenet, 14 octobre 1676; René Cuillierier, 9 septembre 1686; Jacques Lamarque, 9 septembre 1686 et 29 juin 1688; Charles de Launay, 15 juillet 1689, et Jean Le Gras, 4 décembre 1689.

TABELLIONS ET NOTAIRES.

Nous ne mentionnons ici que les tabellions et notaires qui ont pratiqué dans l'île de Montréal et les seigneuries voisines et dont les études ou quelques pièces sont restées au palais de justice de Montréal.

1° Jean de Saint-Père, 1648-1657.

2° Raphaël-Lambert Closse, 1651-1656.

3° Nicolas Gastineau-Duplessis, 1652-1653.¹

4° Bénigne Basset de 1651 à 1677 et de 1678 à 1699.

En 1663, Basset fut à la fois greffier et tabellion de la seigneurie ainsi que greffier et notaire royal, mais il dut opter pour le tabellionnage en 1664. En 1677, Migeon de Branssat lui interdit de pratiquer, mais il put se faire réinstaller en 1678.

5° Nicolas de Mouchy, 1664-1667. Greffier et notaire royal. En 1668, il devint substitut du procureur général au Conseil souverain et partit pour Québec où il demeura jusqu'à son départ pour la France, en novembre 1672.

M. de Mouchy avait emporté avec lui, la plus grande partie des actes qu'il avait faits à Montréal et ces documents sont restés à Québec.

6a° René Rémy, 1669. Il s'intitule "commis au greffe et tabellionnage de Boucherville." Les archives ne possèdent de lui que trois actes datés de 1669. On voit, dans l'*Histoire du notariat* (Roy), I, 208, qu'il était juge au tribunal seigneurial de Boucherville, en 1671. D'après Tanguay, I, 512, Rémy aurait été procureur des PP. Jésuites, à Beauport et il demeurerait probablement à Québec en 1688, puisque c'est là qu'il fait inhumer sa femme.

6b° Thomas Frérot de la Chenest (c'est ainsi qu'il se nomme et signe souvent), 1669-1678. "Notaire royal, résidant au bourg de Boucherville" jusqu'en 1676, il va, ensuite, pratiquer au Cap de la Madeleine, en 1678 et 1679, tel qu'on le constate par des mentions et des

¹ Nous avons publié, l'année dernière, dans les *Mémoires de la Société Royale*, une étude sur ces trois premiers tabellions, avec une analyse de leurs actes.

copies d'actes. On lit dans l'*Histoire du notariat*, I, 208, que la dernière minute de ce notaire est du 29 octobre 1675, mais de récentes fouilles nous permettent de reculer cette date de quatre ans. A l'encontre de plusieurs de ses confrères, Frérot abandonna le notariat pour le négoce et, lorsqu'il mourut, à Québec en mars 1706, il était marchand. A noter, au sujet de la date de sa mort que Tanquay dit 1706 et Roy 1708. Qui a raison ?

7° Christophe Richard "commis pour le rapport des contrats et autres actes qui se passeront dans la côte de Saint-Ours." Il ne reste de ce tabellion que quatre actes datés de 1669, 1670 et 1672.

8° Pierre Cabazié, 1673-1693. Voir la liste des huissiers.

9° René Oudain, "notaire de la côte de Verchères." On n'a de lui que deux actes datés de 1674.

10° Claude Maugue, 1677-1696. Voir la liste des greffiers.

11° Jacques Bourdon, 1677-1720. Voir la liste des huissiers.

12° Adrien Bétourné, "notaire, commis en la seigneurie de Repentigny." Un acte de 1680.

13° Michel Moreau, Boucherville, 1681-1698.

14° Hilaire Bourguine, 1685-1690. Après 1690, il quitte la Nouvelle-France et devient marchand à la Rochelle. (Doc. 8 mai 1713).

15° J.-B. Pottier, 1686-1703.

16° Antoine Adhémar de Saint-Martin, 1687-1714. Venu en qualité de soldat, il pratiqua comme notaire et huissier à Champlain, Sorel, etc., avant de venir à Montréal. Bien qu'il signe tous ses actes: Adhémar, il est évident que dans la société, on le nommait couramment M. de Saint-Martin, car c'est ainsi que la plupart des lettres trouvées dans les archives lui sont adressées. Voir la liste des greffiers, etc.

17° François La Bernade, sieur de la Prairie, s'intitule notaire de la Pointe-aux-Trembles de Montréal, en avril 1687. Il avait été huissier à Sorel, etc., puis instituteur à Montréal et à la Pointe-aux-Trembles. Ce fut un notaire amateur qui ne semble pas avoir reçu de commission. Nous lui avons consacré une notice dans le *Canadian Antiquarian* de 1914, p. 92, parce qu'il paraît avoir été le premier maître d'école laïque de Villemarie.

II.

PREMIÈRE JUSTICE ROYALE OU SÉNÉCHAUSSEE

1663-1666.

Créé le 28 septembre 1663 par le Conseil souverain, ce tribunal se composait d'un juge civil et criminel, d'un procureur du roi, d'un greffier et notaire royal, puis d'un sergent royal.

Les titulaires de ces diverses charges furent:

Juge civil et criminel:

Louis Artus de Sailly, 1663-1666. Salaire, 200 livres par an.¹

Procureur du Roi:

Charles LeMoyné, 1663-1666. Salaire 50 livres par an.

Greffiers et notaires:

Bénigne Basset, nommé en 1663, il résigne en 1664. Voir la liste des notaires seigneuriaux.

Nicolas de Mouchy, nommé le 26 mai 1664, il reste en fonction jusqu'en 1666. Voir sa notice dans la liste des notaires seigneuriaux où nous l'avons placé pour conserver l'ordre chronologique.

Sergents royaux:

Pierre Raguideau. Faillon, (*Hist. de la col.* III, 76) dit, qu'en même temps que M. de Mouchy, on nomma deux sergents royaux de la sénéchaussée: MM. Anicet et Raguideau. Dans les *jug. et délib. du Cons. Souv.* I, 189, il n'est pas question d'Anicet et nous ne trouvons son nom dans aucun document.

Anspessade, puis caporal de la garnison et, enfin, sergent royal, Raguideau fut tué par les Iroquois, en 1665.²

La sénéchaussée ou premier tribunal royal fut supprimé le 18 septembre 1666. (Faillon, *Hist. de la Col.*, III, 162).

¹ Nous avons publié quelques notes sur M. de Sailly dans le *Bulletin des Recherches Historiques*, 1915, p. 206.

² Sur Raguideau, voir nos *Colons de Montréal, Mémoires de la Société Royale*, 1913, n° 308.

III.

DEUXIÈME JUSTICE ROYALE OU PRÉVÔTÉE.

1693-1760.

Par suite du développement de la colonisation dans la région montréalaise, vers la fin du 17^e siècle, la nécessité s'imposa d'établir un tribunal dont la juridiction s'étendrait sur toutes les seigneuries de cette partie de la Nouvelle-France.

Voilà pourquoi, sans doute, Louis XIV, par son édit du 15 mars 1693,² décida l'abolition de la justice seigneuriale et la remplaça par une justice royale.

Au mois de septembre suivant, l'abbé Dollier de Casson renonça à la nomination des officiers de la justice,³ les seigneurs ne se réservant que la nomination du greffier et la garde du greffe.

L'édit royal décrétait que le nouveau tribunal se composerait comme suit:

Un lieutenant général, civil et criminel.

Un procureur du roi.

Un greffier.

Quatre notaires royaux.

Quatre huissiers.

Quatre procureurs postulants tenant lieu d'avocats.

Cette cour siégea d'abord deux fois la semaine: les mardis et vendredis, pendant les "temps plaidoyables" et les mardis, seulement, pendant les vacances.

Dans la suite, le nombre des séances augmente ainsi que le nombre des notaires et des huissiers.

De plus, pour aider le lieutenant général, civil et criminel, on créa la charge de lieutenant particulier.

Parfois, aussi, on choisissait des assesseurs, ordinairement des anciens notaires ou des militaires, suivant la nature du procès, pour décider de la sentence à imposer.

A plusieurs reprises, également, des notaires, des militaires, des huissiers exercent temporairement la fonction de procureur du roi dans des causes de meurtres, de désertions, de faux monnayage, etc.

Les charges de procureurs-postulants étaient assumées par des notaires, des huissiers, des commis du greffe, des clerks de notaires, etc.

On constate, enfin, qu'en plus des huissiers royaux, immatriculés à Montréal, des huissiers du Conseil souverain résidèrent dans cette

¹ Cet édit ne fut enregistré au Cons. souv. que le 8 oct. 1696.

² Le roi avait laissé la nomination du premier juge du nouveau tribunal aux seigneurs, mais ils ne voulurent pas exercer ce privilège. Voir notice sur Migeon de Branssat. (*Bulletin des Recherches Historiques*, 1915, p. 303).

ville, et que certains huissiers des juridictions voisines firent quelques exploits.

Concurremment avec les juges ordinaires, les subdélégués de l'intendant, à Montréal, qui furent, pour la plupart, des commissaires-ordonnateurs, connurent diverses classes de causes.

Il exista, aussi, un poste de la maréchaussée.

LIEUTENANTS GÉNÉRAUX, CIVILS ET CRIMINELS.

En France, dans les grandes juridictions, il y avait un lieutenant-général de police, un lieutenant civil et un lieutenant criminel. A Montréal, on avait fondu ces trois chargés en une seule.

1^o Charles Juchereau de Saint-Denis. Nommé par arrêt du Conseil souverain en date du 5 octobre 1693, M. Juchereau prend possession de sa charge le 17 novembre suivant en prononçant l'allocation d'usage, depuis Migeon de Branssat et il dépose au greffe tous les documents relatifs à sa nomination. Il fut confirmé dans sa charge le 15 avril 1694. (Doutre & Lareau, *Hist. gén. du droit*, 237).

M. Juchereau resta en fonction jusqu'au 8 mai 1702. C'est après cette date qu'il dut partir pour le Mississipi où il allait établir des tanneries, etc. Il ne revint pas de ce voyage et "mourut à Ouabache, dans l'automne de 1703." (Roy, *La famille Juchereau Duchesnay*, 105-107).

2^o Joseph Alexis de Fleury, sieur Deschambault, remplace M. Juchereau à partir du 8 mai 1702. D'après Doutre et Lareau (*Hist. gén. du droit*, 237) il n'aurait été nommé officiellement que le 27 mai 1706. Selon l'abbé Allaire (*Hist. de Saint-Denis*, 312) sa nomination daterait de 1704. Quoiqu'il en soit, il siège, presque sans interruption de 1702 au 22 mars 1715 et décède quelques jours plus tard: le 30 mars 1715.

M. Deschambault avait été, auparavant, juge seigneurial et procureur du roi.

3^o François-Marie Bouat, né à Montréal en 1676 et fils d'Abraham Bouat, principal hôtelier de la ville, en son temps, était lieutenant particulier, lors du décès de M. Deschambault. Il remplace ce dernier en qualité de "lieutenant particulier commis au siège," mais s'absente souvent en 1715 et 1716, peut-être pour avancer sa nomination. Finalement, au début de 1717, il porte le titre convoité de lieutenant général, etc.

M. Bouat conserva sa charge jusqu'à sa mort, en mai 1727.

Il avait épousé Marie-Madeleine, fille de l'aventureux Lambert Dumont, sieur de Clermont et de Sophie Vanneck, hollandaise.

Ajoutons, qu'avant d'être "lieutenant particulier" il fut lieutenant de la maréchaussée, à Montréal et qu'il résidait en "son hôtel" coin Notre-Dame et Saint-François-Xavier.

4° Pierre Raimbault, ancien notaire, et procureur du roi lors du décès de M. Bouat, succède à ce dernier (1726), mais il ne fut titulaire de la charge qu'en 1727. Sépulture, 17 octobre 1740.

Dans les deux dernières années de sa vie, la maladie, probablement, l'oblige de s'absenter fort souvent.

5° Jacques de la Fontaine, conseiller du roi au Conseil supérieur de Québec vint remplacer M. Raimbault au mois de novembre 1740 et il reste en fonction jusqu'au mois d'octobre 1741.

P. G. Roy, dans ses monographies des Conseillers au Conseil supérieur, 1915, page 181, le nomme Jacques de la Fontaine de Belcour et nous informe qu'il mourut à Québec au mois de juin 1765.

6° Jacques-Joseph Guiton, écuyer, sieur de Monrepos prit la présidence du tribunal au mois de novembre 1741 et la conserva jusqu'à la capitulation de Montréal.

LIEUTENANTS GÉNÉRAUX INTÉRIMAIRES.

Pierre Cabazié, 1698, 1702, 1703, 1705. (Voir la liste des huissiers.)

Antoine Adhémar, greffier et notaire, 1703.

Pierre Raimbault, 1701, 1702, 1713, 1718, 1720 à 1727.

Michel LePallieur, notaire et huissier, 1715, 1720, 1726.

Nicolat Senet, notaire, 1727.

J.-C. Raimbault, fils, notaire, 1730, 1731, 1733.

J.-B. Decoste, huissier, 1735.

J.-B. Adhémar, 1736 à 1743, greffier, notaire, huissier.

Guillet de Chaumont, notaire, 1740.

Danré de Blanzay, 1741, 1758, greffier et notaire.

LIEUTENANTS PARTICULIERS.

Outre les lieutenants généraux civils et criminels intérimaires, il y eut des lieutenants particuliers qui assistaient les lieutenants généraux, "siégeaient avec eux ou les remplaçaient" à l'occasion (Doutre et Lareau, *Hist. gen. du droit*, p. 130).

François-Marie Bouat, d'après Lareau, *Histoire du droit*, I, 247, aurait été nommé lieutenant particulier le 7 juillet 1711, cependant nous ne le voyons figurer dans les actes en cette qualité qu'en 1713, 1714, 1715 et 1716 après quoi il devint lieutenant général.

Pierre Raimbault, procureur du roi est lieutenant particulier "commis", pendant la plus grande partie de l'année 1716.

Jean-François Malhiot, ancien marchand, fut lieutenant particulier de 1741 à 1753.

PROCUREURS DU ROI.

1° Jacques Alexis de Fleury, sieur Deschambault, avocat en parlement. Ancien juge seigneurial, il entre en fonction au mois de novembre 1693, puis il est promu lieutenant général, civil et criminel en 1702. Mort en 1715. (Voir la liste des lieutenants généraux.)

2° Pierre Raimbault, remplace régulièrement M. Deschambault, à partir de 1702, mais il n'est officiellement nommé que le 27 mai 1705 (Doutre & Lareau, p. 237). En 1727, il devient lieutenant général.

3° François Foucher, 1727-1759. Doutre et Lareau, dans l'*Hist. gén. du droit*, 265, nous informent qu'il fut nommé le 29 avril 1727, cependant, il ne figure dans les documents judiciaires qu'au mois de janvier 1728 et sa famille paraît continuer à demeurer dans la région de Québec, d'où il venait, encore deux ans de plus. Tanguay (IV, 79) a vu des pièces, qu'il n'indique pas, où ce procureur était appelé *Fouchet de Labrador*. Il signe toujours Foucher, et occupe en qualité de procureur, jusqu'en 1756, mais après cette date, nous ne constatons sa présence qu'une fois, en 1759.

PROCUREURS DU ROI INTÉRIMAIRES.

Pierre Cabazié, huissier, 1696 à 1701.

Pierre Rivet, 1701. Voir la liste des greffiers intérimaires.

Pierre Raimbault, notaire, etc., 1701 à 1706 alors qu'il devient titulaire.

Jean Cusson, notaire, 1707-1708,

Michel LePallieur, notaire, etc., 1715 à 1730. Il prend le titre de substitut du procureur du roi à partir de 1716.

Jean-Baptiste Adhémar, notaire, etc., 1717, puis de 1729 à 1754, comme substitut.

Étienne Rocbert de la Morandière, 1723. Garde magasin du roi.

Jean-Baptiste Tetro, notaire, 1727.

François Simonnet, notaire, de 1738 à 1760.

Pierre Le Gardeur de Repentigny, 1732, 1733.

Guillet de Chaumont, notaire, 1734, 1736, 1740, 1741.

Gaudron de Chèvremont, notaire, 1736.

François LePallieur, notaire, 1738.

Danré de Blanzzy, notaire, 1739 à 1742.

Liénard de Beaujeu, 1740.

Jean Latour, notaire de Québec, 1740.

Baron de Longueuil, 1742, 1744, 1745.

Gaspard Adhémar de Lantagnac, 1749.

Henri Bouron, notaire, 1752.

Payan de Noyan, 1751, 1754, 1755.

Pierre-Joseph Celoron de Blainville, 1756.

Antoine Girouard, huissier, 1758.

GREFFIERS.

1° Antoine Adhémar de Saint-Martin, du 17 novembre 1693 à son décès, en avril 1714. Voir aussi la liste des notaires.

2° Jean-Baptiste Adhémar, fils du précédent. De juin 1713 à avril 1714, il est commis greffier et remplace souvent son père. Après le décès de ce dernier, il devient greffier et reste en fonction jusqu'à la fin 1718. Par la suite, il est greffier intérimaire à plusieurs reprises. Il figure en plus dans la liste des notaires, etc.

3° Jacques David, notaire. Doutre et Lareau, dans leur *Histoire générale du droit*, disent que le 20 septembre 1718, il devint locataire du greffe de Montréal, en vertu d'un bail consenti par l'abbé Vachon de Belmont, représentant les Seigneurs de Montréal. Cependant, il ne présente sa requête pour être installé greffier que le 8 janvier 1719. Il conserva sa charge jusqu'à sa mort, survenue en octobre 1726.

4° Joseph-Charles Rimbault de Piémont, 1727 à 1732. Il signe ordinairement: Rimbault. fils, mais aussi, *Piémont* et prend parfois le titre de greffier en chef.

5° Claude-Cyprien-Jacques Porlier déclare au tribunal, le 20 septembre 1732, qu'il a été nommé greffier par M. l'intendant le 9 du même mois et il devient titulaire. Il exerce sa charge jusqu'en 1744. Voir la liste des notaires.

6° Louis-Claude Danré de Blanz y reçoit sa commission de greffier le 13 novembre 1744 et la présente au tribunal le 19 du même mois. M. de Blanz y resta en fonction jusqu'en 1760.

GREFFIERS INTÉRIMAIRES.

Georges Pruneau, 1694, 1696, 1697 et 1698. Voir la liste des huissiers.

Antoine Galipeau, 1697. Dans la même année, il est procureur à diverses reprises.

Pierre Rivet, commis greffier, 1699, 1700, 1701. On le trouve, plus tard, greffier du Conseil souverain, à Québec. Tanguay, VI, 587, nous apprend qu'il épouse Marie-Madeleine Rageot à Québec en 1708 et qu'il décède dans cette ville, en février 1721. Il devait être le frère d'Alexandre Rivet, mentionné dans la liste des procureurs postulants.

Michel Lepallieur, notaire, huissier, etc., 1703, 1705, 1717.

Jacques David, notaire et plus tard greffier, agit comme greffier commis, au mois d'août 1718.

Maurice Blondeau, négociant, 1721.

J.-B. Marts, commis greffier, 1722.

Antoine Puypérour de la Fosse, 1723. Voir les listes des notaires et des huissiers.

Christophe-Hilarion Du Laurent, 1724, 1726, 1727, 1728. Postulant à Montréal de 1722 à 1728, il devient ensuite notaire à Québec et greffier au Conseil supérieur. Mort à Québec le 13 avril 1760.

Jean-Baptiste Adhémar, notaire et ancien greffier, 1725, 1726, 1728 et 1749 à 1753.

Joseph-Charles Rimbault de Piémont, 1726. Devint ensuite greffier titulaire.

Charles Benoist dit Berthier, 1729, 1730, 1731, 1732, 1733, 1734.

Il était clerc chez le notaire Rimbault, et signe parfois Benoist et parfois Berthier. En 1745, 2 août, une de ses lettres trouvée dans les archives, nous apprend qu'il est, dans le moment, à Michillimakinac; il annonce qu'il part pour les Illinois et demande au destinataire de le faire nommer dans quelque bon poste, s'il le peut. Il ajoute qu'à Michillimakinac, il n'y a que coquineries.

Nicolas Augustin Guillet de Chaumont, 1729, 1732. Voir la liste des notaires.

François Masson dit Champagne, 1730. Il est procureur postulant de 1730 à 1737, puis comparait comme témoin dans diverses pièces jusqu'en 1758. Le 30 décembre de cette dernière année, on le dit maître d'école, demeurant chez J. C. Decoste fils, huissier, rue Notre-Dame.

J. B. Decoste, 1731, 1735, 1737, 1738. Voir la liste des huissiers.

Charles René Gaudron de Chèvremont, 1732, 1733, 1734, 1735. Voir la liste des notaires.

Pierre Simon, sergent, 1735.

François Lepallieur, fils de Michel, 1736, 1738, 1739. Voir la liste des notaires.

. . . Louet, 14 août 1736. Ce doit être Jean-Claude Louet, qui succéda à son père, comme notaire, à Québec, en 1739.

Cyr de Monmerqué, sieur Dubreuil, 1737. Voir la liste des notaires et des huissiers.

Louis-Claude Danré de Blanzly, 1737 à 1744, année en laquelle il devient greffier titulaire. Voir aussi la liste des notaires.

J.-C. Porlier, 1739 à 1744. Il cesse d'être assistant greffier après la mort de son père et la nomination de M. Danré de Blanzly. Sa signature ressemble tellement à celle de son père qu'il faut avoir

vu une pièce du 17 mai 1741 et une autre du 21 décembre 1743 pour être convaincu que deux Porlier, le père et le fils, étaient employés au greffe.

Charles Deguire, 1748 et 1749. Voir la liste des notaires.

Henri Bouron, 1754. Voir la liste des notaires.

Pierre Panet, 1755 à 1758. Voir la liste des notaires.

Claude Le Houiller, 1758. Voir la liste des huissiers.

Jacques Crevier Duvernay, 1759. Voir la liste des notaires.

GREFFIERS DES CONSEILS DE GUERRE.

Certains procès de soldats accusés de désertion ou d'autres offenses furent jugés par des conseils de guerre et, dans ces cas, l'on nomma des greffiers spéciaux.

Charles-René Gaudron de Chevrement, 1735.

Danré de Blanzy, 1742, 1751.

Étienne Müller, sergent, remplace M. Danré de Blanzy en 1751 et 1754.

Pierre Guerry, sergent, en 1751 et 1752.

J.-B. Campau, 1752.

Claude Fabre dit Lalancette, sergent, 1755.

HUISSIERS ROYAUX.

Bien que l'édit de création du tribunal royal porte qu'il n'y aura que quatre huissiers à Montréal, le juge Juchereau, le 17 novembre 1693, semble avoir prié au moins cinq anciens huissiers du bailliage d'exercer leurs fonctions jusqu'à ce que le Conseil supérieur eut fait son choix, ce qui arriva au mois de mars 1694.

A cette date, quatre furent confirmés dans leurs charges; cependant, à partir de 1696, le nombre de ces officiers paraît avoir été augmenté parce que l'on permit à des huissiers de juridictions voisines de pratiquer à Montréal; parce que des notaires ou autres personnes furent autorisées à instrumenter comme huissiers dans certaines seigneuries ou régions et aussi, à partir de 1703, parce qu'on trouve presque toujours, à Montréal, au moins un huissier du Conseil supérieur qui y réside.

Ainsi que le remarque l'honorable Désiré Girouard: "les huissiers, à cette époque, avaient un autre rôle qu'aujourd'hui; ils faisaient les décrets et, en cela, remplissaient les fonctions de shérifs; ils faisaient également les sommations des tribunaux que font aujourd'hui, les greffiers. Enfin, ils faisaient les protêts que font, aujourd'hui, les notaires et, aussi les significations des pièces de procédures."¹

¹ *Bulletin des Recherches Historiques*, V, 39.

1° Pierre Cabazié, déjà mentionné dans la précédente liste. Appelé en 1693; confirmé dans sa charge en mars 1694. Pratique jusqu'à sa mort en 1715. Voir la liste des notaires.

2° Jean Quesneville. Mentionné dans la liste précédente. Appelé en 1693, confirmé dans sa charge, en mars 1694. Pratique jusqu'à son décès, 23 août 1701.

3° François Lory. Mentionné dans la liste précédente. Recommandé en 1693. Confirmé dans sa charge en mars 1694. Pratique jusqu'en 1701.

4° Georges Pruneau. Mentionné dans la liste précédente. Appelé en 1693. Confirmé dans sa charge en 1694. Pratique jusqu'en 1705.

5° Jean Petit. Mentionné dans la liste précédente. Recommandé en 1693. Ne semble commencer à pratiquer que de 1702 à 1719. Il demeure coin des rues Saint-François et Capitale.

6° Daniel Normandin, huissier royal, résidant à Champlain. Fait une couple d'exploits, au mois d'août 1696, puis ne paraît qu'en 1715, 1717 et 1718. Il résida temporairement à Montréal, chez M. Saintonge, rue Saint-Joseph. Voir aussi, sur ce personnage, la liste des notaires.

7° Michel Moreau. Mentionné dans la liste précédente. Pratique à Boucherville, en 1698.

8° Antoine Hatanville. Mentionné dans la liste précédente. Recommence à pratiquer de 1699 à 1705.

9° Jean Meschin, demande son installation le 20 septembre 1702. Pratique jusqu'en 1711. Plus tard, nous constatons qu'il est huissier à Québec.

10° Jacques Bourdon. Mentionné dans la liste précédente immatriculé à Montréal et résidant à Boucherville. Instrumente de 1703 à 1719.

11° Michel LePallieur, huissier du Conseil supérieur, s'établit à Montréal au commencement de 1703. Pratique jusqu'en 1730. Voir la liste des notaires, etc.

12° Jean Leroux. Ne figure que dans une pièce du 23 février 1704.

13° Jean-Baptiste Pottier. Huissier royal dans toute l'étendue de la Nouvelle France, immatriculé en toutes les juridictions, résidant ordinairement aux Trois-Rivières. Instrumente à Montréal le 8 août 1705.

14° Nicolas Senet, pratique de 1706 à 1718. Voir la liste des notaires.

15° Abel Michon, le 14 janvier 1707, présente une requête pour être admis à pratiquer comme notaire et huissier dans les seigneuries

de Verchères, Contrecoeur, Saint-Ours, Sorel, etc. Voir la liste des notaires.

16° Antoine Puyperoux de la Fosse, demande son installation comme huissier le 22 juillet 1715. Il pratique à Montréal jusqu'en 1725 alors que le 21 avril de cette année il est pourvu d'une commission l'autorisant à faire des actes notariés. Par la suite, on constate qu'il fait encore des exploits et qu'il réside à la "Côte du chenail du nord." Pendant son séjour à Montréal, il demeurait rue de l'Hôpital et fut huissier audiencier en 1723.

17° Antoine Perrin, 1719-1738. Il était soldat dans la compagnie de M. de Lacorne et âgé de 26 ans, lorsqu'il reçut sa commission, au mois d'août 1719. Il résida rue Saint-Joseph, rue Saint-François et rue Notre-Dame.

18° André Dorien, 1720-1729. Son nom devait se prononcer Dorian, car on l'orthographie ainsi, dans certains actes. M. Dorien changea souvent de local, si l'on en juge par les adresses successives qu'il indique dans ses exploits: rue Saint-François, rue Capitale, rue Hôpital, Place d'Armes, rue Saint-Jacques, enfin sur "la grande place, près de la paroisse" ou "place Notre-Dame." Il était âgé de 43 ans en 1724, mais nous ignorons d'où il venait et ce qu'il devint.

19° Nicolas Thibault, 1720-1725. Cet huissier demeura à Lachenaye et à Mascouche.

20° Claude Dudevior, 1722-1734. Il reçut commission le 29 juillet 1722 et se présenta au tribunal le 11 septembre. On constate qu'il demeura rue Notre-Dame et rue Saint-Jean.

21° Antoine Girouard, soldat de la compagnie de M. de la Tour est témoin dans un procès le 25 mars 1722. Le 26 avril 1723, il reçoit sa commission d'huissier et demande au tribunal de l'installer, le 25 mai suivant. Il pratique comme huissier jusqu'en 1735. Ensuite il n'apparaît plus devant le tribunal que comme procureur-postulant. Sépulture à Montréal le 5 juin 1767.

22° Nicolas Marchand 1727-1735. D'abord tailleur d'habits (1722) il semble commencer à exercer la charge d'huissier au mois de septembre 1727. Il demeurait rue Notre-Dame.

23° Jean-Baptiste Decoste. Fils d'un major. 1731-1759. Decoste était brigadier des gardes au Domaine d'occident à Montréal, c'est-à-dire qu'il était "chargé de veiller aux fraudes qui se font au préjudice des droits du dit domaine et d'empêcher le commerce étranger et la traite de l'eau de vie aux sauvages" lorsqu'il reçut, le 22 novembre 1731 sa commission d'huissier. Il la présente au tribunal le 30 décembre 1731. M. Decoste, à cette époque, avait 28 ans et était gendre de l'huissier Nicolas Marchand. A partir

de 1733, il devint huissier audencier et conserva ce poste jusqu'à la conquête. Résida rue Notre-Dame et rue Saint-Vincent.

24° Jean-Baptiste Adhémar, 1732-1744. Huissier du Conseil supérieur, à Montréal. Voir la liste des notaires, etc.

25° Joseph Saulquin dit Saint-Joseph, 1732-1760. Présente sa requête le 28 juillet 1732 et il est agréé. Domicilié rue Saint-Jean. On le nomme parfois Saint-Joseph, tout court.

26° François Moreau. 1735-1737. Résidait à la Rivière des Prairies.

27° Cyr de Monmerqué, sieur Dubreuil. 1735-1760. Demeura à Varennes puis à Dorvilliers. Il signe parfois Dubreuil, mais le plus souvent Monmerqué.

Il ne faut pas le confondre avec l'huissier du Conseil supérieur et notaire, Jean-Étienne Dubreuil dont le nom figure, vers la même époque, dans des pièces du greffe de Montréal, mais au bas d'exploits faits à Québec.

M. Cyr de Monmerqué fut également et à plusieurs reprises procureur-postulant entre 1726 et 1760. Voir la liste des notaires.

28° François Comparet, 1736-1755. Demeurait à la Pointe-aux-Trembles. Voir la liste des notaires.

29° Amable Brugière, 1736-1755. Reçut sa commission le 3 septembre 1736 et se présenta devant le tribunal le 28 des mêmes mois et an. Résida à Boucherville et à Montréal.

30° Artus-Laurent Guignard, 1738-1744. Caporal dans les troupes, il commence à pratiquer en qualité de procureur-postulant, dès 1734, puis, le 11 février 1738, présente au tribunal, une requête pour qu'il soit autorisé à succéder au défunt huissier, F. Moreau.

Il demeura rues Notre-Dame, Saint-Joseph et Saint-Vincent.

31° Charles-Georges de Rey, 1739. Écrivain chez le notaire Le Pallieur depuis 1735, il demande au tribunal, le 25 mai 1739, à remplacer feu Antoine Perrin. Il disparaît à la fin de la même année.

32° Charles Davaine, 1740-1751. Il demande la succession de M. de Rey le 11 janvier 1740 et démissionne onze ans plus tard.

33° Jacques Olivier, 1740-1759. Le 9 mars 1740, il déclare par requête, qu'il a obtenu commission pour exercer dans l'île Jésus, Repentigny, Lachasnaye, Rivière des Prairies et la paroisse de Terrebonne. En 1755, il résidait au "bourg de Terrebonne."

34° Jean-Baptiste Guyart, 1741-1745. Il présente sa requête pour être admis huissier, le 20 février 1741. Après avoir demeuré à Boucherville, il réside à Montréal, rue Sainte-Thérèse et paraissait avoir une bonne clientèle, tant comme huissier que comme procureur lorsqu'il se trouva impliqué avec Eynard en 1745, dans une affaire

de destruction d'un dossier et sa carrière finit là. Voir le nom Eynard dans la liste des procureurs.

35° François Dumergue, 1746-1756. Huissier du Conseil supérieur, il paraît être venu de Québec s'établir à Montréal. On constate qu'il fut domicilié rue Notre-Dame, puis rue Saint-Jacques.

36° Nicolas-François Robert, 1746-1760. Demeura rue Notre-Dame et rue Saint-Sacrement.

37° François Quenet, 1750-1755. Venu de Québec, il s'établit dans l'île Jésus, puis à Montréal et retourne dans l'île Jésus. A Montréal, il eut son domicile, rues Notre-Dame et Saint-Pierre.

38° Pierre Hastier dit Desnoyers, 1751-1753. Le 23 juillet 1751, il reçut sa commission pour remplacer C. Davaine, démissionnaire et présenta sa requête au tribunal le 10 août.

39° Jacques-Joseph Cheval, dit Saint-Jacques, 1751-1757. Peruquier en 1743, cabaretier en 1744 il devint huissier du Conseil supérieur en 1751. Demeura rues Saint-François et Saint-Augustin.

D'après Tanguay, III, 54, J. J. Cheval fut garde du port à Montréal, mais nous ignorons à quelle date.

40° Joseph Le Brun, 1752-1757. Réside à Boucherville puis à Varennes.

41° Jean-Christophe Decoste fils de Jean-Baptiste, 1753-1760. Présente sa requête pour être installé, le 10 mars 1753. Il signe, quelques fois, C. Decoste, mais le plus souvent: Decoste fils. Le 21 novembre 1757, Decoste fils épousait la veuve Bigeau, de beaucoup plus âgée que lui. Ce mariage déplut tellement au père Decoste qu'il exhérèda son fils le lendemain, par acte passé devant maître Hodiesne.

42° François Rigaut, 1755. Huissier du Conseil supérieur de Québec. Réside à Maskinongé en 1755.

43° Claude Le Houlier, 1755-1760. Obtient sa commission le 17 avril 1755 et présente sa requête le 22 du même mois. Demeurait rue Notre-Dame. Il signe Houlier.

44° Barthélemy-Joseph Richard, 1755. Notaire de la région de Québec de 1751 à 1769, il fit quelques exploits comme huissier à Montréal en 1755. Son greffe est à Kamouraska.

45° Étienne Miquel, 1755-1760. Résida rue Saint-Paul et rue Saint-François.

¶ Dans le greffe de François Simonnet, à la date du 8 mars 1762, on trouve un contrat de mariage rédigé, le 22 novembre 1760, par le sieur Miquel "notaire royal, résidant à Boucherville." Miquel fut-il réellement notaire? On peut en douter, puisqu'en l'an 1762, les parties déposent le document chez le notaire Simonnet et que

ce dernier ajoute au bas, un acte de ratification dans lequel il dit que le contrat avait été dressé par "le nommé Miquel se disant notaire royal" !

GÉOLIER ET CONCIERGES DES PRISONS ROYALES.

Jean Quesneville, 1693 à 1700. Voir la liste de la première partie et celle des huissiers. Quesneville fut en plus, maître tailleur, chantre et bedeau.

Antoine Hatanville, 1700 à 1703. Voir la liste des huissiers.

Michel LePallieur, 1703 à 1730. En cette dernière année ou en 1731, à la suite de l'évasion de trois soldats, il est relevé de ses fonctions et même emprisonné, à son tour. Ce vieux fonctionnaire semble avoir été gracié, mais il ne paraît pas avoir repris l'exercice de sa charge. Voir la liste des notaires.

Nicolas Marchand, 1731. Voir la liste des huissiers.

Charles LePallieur, fils de Michel, obtient la charge de concierge et géolier en 1735 et soumet sa commission au tribunal le 10 juillet. On le trouve en fonction jusqu'en 1748. Un acte du 22 juin 1753 nous apprend qu'il est alors négociant.

Pierre Mayet est géolier en 1752 et 1754.

Alexandre Larche assume la charge en 1755 et nous paraît l'avoir conservée jusqu'à la conquête.

ASSESEURS.

1731, 12 juin. Procès de J. B. Lagrange, de Saurel, accusé de vol. Assesseurs: J. B. Adhémar, notaire, Ignace Gamelin, Joseph-François Malhiot et J. B. Neveu. Ces trois derniers étaient des marchands qui furent choisis "à défaut de praticiens."

1732, 15 novembre. Gaudron de Chevremont, Guillet de Chaumont et J. B. Adhémar.

1734. Procès de l'esclave Marie-Angélique accusée d'avoir été cause de l'incendie d'une partie de Montréal. Assesseurs: François Le Pallieur, Guillet de Chaumont, Gaudron de Chevremont et J. B. Adhémar, tous notaires.

1734. Procès de Bastien dit le Canadien, soldat, accusé du meurtre de Tourangeau, tambour. Assesseurs: Gaudron de Chevremont, J. B. Adhémar et Guillet de Chaumont.

1741. Procès de Bourbonnais dit Bellefleur, tambour, accusé de vol. Assesseurs: Guillet de Chaumont et J. B. Adhémar.

1742. Procès de Céré. Assesseurs: J. B. Adhémar, Guillet de Chaumont, Danré de Blanz y et F. Simonnet.

De 1750 à 1759, les assesseurs sont tour à tour: MM. Malhiot, Souste, Adhémar, Bouron, Simonnet, Hodiesne et A. Foucher, tous notaires, à l'exception de Malhiot qui était lieutenant particulier.

INTERPRÈTES.

Jean Le Gras, interprète en langue sauvage, 1702-1705.

Louis Maran de la Chauvignerie, interprète en langue iroquoise, 1708, 1718, 1719.

Joseph Poupart, interprète en langue anglaise, 7 mars 1714. Il était né à Manhatte où ses parents demeuraient. Poupart fut impliqué dans un procès de faux-monnayeurs, en 1717.

. . . Lalande, interprète en langue anglaise, 18 août 1714.

Robert Pottier, sieur Dubuisson, interprète en langues flamande et anglaise, octobre 1715 et juillet 1716.

Thomas de Joncaire, interprète en langue sauvage, 5 août 1722.

Maurice Ménard, interprète en langue sauvage, 14 juillet 1735.

Louis-Hector Piot, sieur de Langloiserie, interprète en langue anglaise, procès Stobo, 22 octobre 1756.

Louis Daveluy dit Larose, 1756, 1757, 1758. Interprète en langue anglaise.

NOTAIRES ROYAUX.

Dans le tableau des notaires qui ont pratiqué sous la justice seigneuriale, se trouvent les noms de ceux qui restèrent en fonctions sous la seconde justice royale.

Cela se constatant facilement par les dates, il nous suffira donc, ici, de continuer la liste précédente.

18° Pierre Raimbault, 1697-1727. Occupa plusieurs charges importantes dans la justice de cette époque. Nous avons publié quelques notes sur sa famille dans le *Bulletin des Recherches Historiques*, 1915, p. 78.

19° Marien Tailhandier dit La Beaume, 1699-1730. Il était chirurgien en même temps que notaire.

20° Jean Cusson, 1700-1704. Résidait à la Pointe-aux-Trembles. Avant 1700, il avait été notaire, greffier et procureur, au Cap de la Madeleine.

21° Michel LePallieur, 1702-1733. Pratiqua à Québec de 1701 à 1702, puis vint s'établir à Montréal en qualité d'huissier du Conseil souverain, de procureur et de notaire.

Il a rempli toutes les charges judiciaires possibles, depuis lieutenant général civil et criminel (intérimaire) jusqu'à géolier et concierge de prisons "royaux" suivant l'expression du temps. M.

Lepallieur fut inhumé à Montréal, le 10 avril 1733, âgé de 77 ans. Voir la liste des concierges et géoliers.

22° Nicolas Senet, 1704-1731. Résida à la Pointe-aux-Trembles. D'abord marchand, il devint notaire et huissier. Décède le 18 janvier 1732.

23° Abel Michon, 1706. Sa première commission, du 17 juin 1706, lui permettait de pratiquer dans les seigneuries de Contrecoeur et de Verchères. Le 14 janvier 1707, il présente une requête pour être autorisé à pratiquer, en plus, dans les seigneuries de Saint-Ours, Sorel, Berthier, l'Isle Dupas, La Valtrye, et Saint-Sulpice.

Son orthographe est fort originale. En voici un échantillon: "lieutenant générale, Siville et Criminelle de la jeurection Royal de lisle de Montréal. Supplis . . . sidevant . . . l'intendent de jeustis, pollis et finans . . . la commitions . . . vous plaise ressevoir . . . le dit supplient en les dit calité."

Au mois d'avril 1711, il fut nommé notaire pour le gouvernement de Québec et il quitta notre région. Son greffe, qui ne prend fin qu'en 1749, est déposé à Montmagny.

24° Guillaume Barette dit Courville, immatriculé à Montréal et résidant à Laprairie, 1709-1744. En 1698 et 1699, il était postulant à Montréal.

25° Jean-Baptiste Tétro, 1712-1718. Lors de l'émission de sa première commission, il était maître d'école.

26° Jean-Baptiste Adhémar, 1714-1754. Il succédait à son père, en 1714, en qualité de notaire et de greffier, et fut procureur de 1713 à 1744. Sépulture, 19 décembre, 1754.

27° Daniel Normandin. Notaire du gouvernement des Trois-Rivières, il ne dressa que quelques actes, en 1715, à Montréal, car les notaires de ce lieu s'opposèrent devant le tribunal, à ce qu'il continuât. Il pratiqua, cependant, comme huissier, à diverses reprises. Voir la liste des huissiers.

28° Jacques David, 1719-1726. Il fut en même temps, notaire et greffier. Inhumé à Montréal, le 17 octobre 1726.

29° François Coron, 1721-1732. Pratiqua dans l'île Jésus. Sépulture à Saint-François de Sales, le 13 janvier 1733.

30° Antoine Puypéroux de la Fosse, demande au tribunal, le 21 avril 1725, à être autorisé à pratiquer comme notaire dans les seigneuries à l'est de l'île de Montréal. Partie de son greffe est à Sorel et partie aux Trois-Rivières. De 1715 à 1742, il agit souvent en qualité de procureur.

31° Nicolas-Augustin Guillet de Chaumont. Fut procureur en 1720 et 1721, puis notaire de 1727 à 1752. Inhumé, à Terrebonne, le 3 avril 1765.

32° Joseph-Charles Raimbault de Piémont, fils de Pierre Raimbault, 1727-1737. Sa commission date du 31 décembre, 1726. Sépulture à Montréal, le 18 décembre 1737. Voir la liste des greffiers.

33° Antoine Loiseau dit Challon, 1730-1760. Boucherville. Présente sa requête pour être admis à pratiquer le 3 août 1730.

34° Cyr de Monmerqué, sieur Dubreuil, 1731-1765. Nous avons publié des notes sur ce notaire dans le *Bulletin des Recherches Historiques*, 1915, p. 363. Voir, aussi, la liste des huissiers.

35° René Chorel de Saint-Romain, 1731-1732, Pointe-aux-Trembles. Présente sa requête pour être installé, le 3 août 1730, mais il ne fut agréé qu'après sa seconde requête, en avril 1731. Il mourut dans la soirée du 29 décembre 1732, à la suite d'une bagarre qui avait eu lieu la veille et au cours de laquelle il chercha à protéger sa fille contre un groupe de gens qui festoyaient dans la paroisse. Au témoignage du curé, M. Chorel ne reçut aucune blessure, mais comme il était malade depuis longtemps, cet événement dut hâter sa fin.

36° Charles-René Gaudron de Chevremont, 1732-1739. Présente sa requête pour être installé le 13 novembre 1732 et déclare avoir une commission datant du 27 juillet précédent.

37° Claude-Cyprien Jacques Porlier 1733-1734. Sépulture à Montréal, le 3 septembre 1744. Voir la liste des greffiers.

38° Jean-Baptiste Jenvrin Dufresne, 1733-1750. Pointe-aux-Trembles. Inhumé, dans cette paroisse, le 14 octobre 1750.

39° François LePallieur, fils de Michel, 1733-1739. Ayant obtenu, le 20 avril 1733, une commission de notaire comme successeur de son père, il se présente au tribunal, le 18 mai, pour être agréé. Sépulture au fort Niagara, le 31 janvier 1741, où il était devenu garde des magasins du roi.

40° Charles-François Coron, Ile Jésus, 1734-1767. Il succédait à son père, François Coron.

41° Simon Sanguinet, 1735-1747. Ancien marchand, nommé d'abord pour Varennes, puis pour Montréal.

42° François Comparet, 1736-1755, Pointe-aux-Trembles. Dans sa requête présentée le 28 novembre 1735, il déclare avoir commission depuis le 3 novembre pour exercer à la Pointe-aux-Trembles, Rivière des Prairies, La Chesnaye, Repentigny, Saint-Sulpice et Lavaltrie. Sépulture à Pointe-aux-Trembles le 12 octobre 1755. Voir aussi la liste des huissiers.

43° François Simonnet, 1737-1778, Boucherville et Montréal. Présente sa requête pour être autorisé à pratiquer, le 2 juillet 1737.

Il avait fait partie de la communauté des Frères Charon, et avait été maître d'école à Longueuil, en 1721. En religion, il s'appelait "frère Simonnet de la Croix."

44° François-Pierre Cherrier, 1738-1789. Longueuil.

45° Louis-Claude Danré de Blanzv, 1738-1760.

D'abord procureur (1736), il reçoit sa commission de notaire le 20 mars 1738 et la présente au tribunal le 24 mars. Il demeura rue Capitale et après la conquête retourna en France. Il vivait encore en 1770 comme on le constate par une procuration que lui adresse madame Soumande. (Greffé Bouvet, 16 septembre, 1770). Voir aussi la liste des greffiers.

46° Gervais Hodiesne, 1740-1764. Ancien frère hospitalier (frère Charon), il demeura à Chambly. On écrit souvent Hodienne, mais c'est une erreur.

47° Jean Latour, 1741. Il n'a pratiqué que quelques mois, à Montréal, en 1741. Il venait de Québec et il y retourna. La plus grande partie de son greffe est dans la capitale.

48° André Souste, 1745-1769. Ancien fabricant de bas, chez les Frères Hospitaliers. Sépulture 13 février 1776, âgé de 86 ans.

49° Antoine Foucher, 1746-1800. Originaire du Berry, il fut marchand avant d'être notaire. Ne semble pas être de la même famille que François Foucher, le procureur du roi. Inhumé à Montréal le 17 février 1801.

50° Jacques Crevier Duvernay, 1748-1762. Varennes, etc. Décédé à Verchères, le 17 mai 1762.

51° Jean-Baptiste Daguilhe, 1749-1783. Le 13 mars 1749, il présente au tribunal, sa requête pour avoir l'autorisation d'exercer sur la côte nord du district de Montréal. Son greffe est à Joliette.

52° Henri Bouron, 1750-1760. Nommé notaire le 27 décembre 1749, il démissionne en 1754, et devient "écrivain de la marine" c'est-à-dire employé au bureau du commissaire de la marine, à Montréal. Il reprend l'exercice de sa profession de notaire au mois de juillet 1758. Son dernier acte porte la date du 16 septembre 1760.

53° Thomas Vuatier, 1751-1785. Pratiqua à Soulanges.

54° Pierre Lalanne, 1752-1767. Laprairie.

55° Doullon Desmarets, 1753-1754. Pointe-Claire.

56° Louis de Courville, 1754-1781. Il avait été commissionné pour l'Acadie en 1754. Plus tard, il pratiqua à Québec et les années 1756 à 1758 de son greffe sont restées dans cette ville. Après cette date, il vint demeurer à Montréal. Sous le régime anglais, il exerça, en plus, la profession d'avocat.

57° Pierre Panet, 1755-1778. On peut consulter sur ce notaire, l'excellent ouvrage de M. Pierre-Georges Roy: *La famille Panet*. Il présente sa requête pour être installé le 17 janvier, 1755.

58° Philippe-Pierre Pilliamet, 1755-1760. Présente sa requête pour être autorisé à pratiquer, le 18 avril 1755.

59° Antoine Grisé, 1756-1785. Chambly. Sa requête pour demander au tribunal l'autorisation de pratiquer, porte la date du 28 avril 1756.

60° Pierre Mézières, 1758-1786. Pourvu d'une commission de notaire le 25 mars 1758, il présente sa requête le 6 avril 1758.

61° Charles Deguire, 1758-1762. Saint-Antoine. Dans sa requête présentée au tribunal le 15 novembre 1758, il dit avoir commission de M. de Contrecoeur pour exercer dans Contrecoeur et Saint-Denis.

NOTA—Louis Loiseau (fils d'Antoine) notaire de la seigneurie de Boucherville, commence à pratiquer, un mois après la capitulation de Montréal.¹

PROCUREURS POSTULANTS.

Pour remplacer les avocats auprès du tribunal royal, le roi avait permis de nommer quatre procureurs-postulants; cependant, nous ne rencontrons trace d'aucune commission de postulants dans les archives de Montréal.

Il semble même que chacun avait la liberté de plaider pour soi ou pour d'autres, car les procureurs se recrutent dans toutes les classes sociales et leur nombre est si grand que nous nous bornons à ne mentionner que quelques noms, laissant de côté les notaires, les huissiers et les écrivains, praticiens ou clercs dont les noms figurent dans d'autres listes.

Charles Varin, de février à août 1696.

Alexandre Rivet, de 1699 à 1701. Voir Pierre Rivet dans la liste des greffiers intérimaires.

Pierre Regnaud, praticien, 1706. Le 21 février 1707, étant "écrivain" chez M. le gouverneur de Ramezay, il fut arrêté pour avoir fabriqué des monnaies de cartes de 16 livres. Il était natif de Saint-Nazaire en Saintonge et n'avait que 17 ans.

Nicolas Lanouillée, agent de messieurs de la compagnie du castor en ce pays, mai 1716. Il devint membre du Conseil supérieur en 1722.

Jean-Baptiste Paumereau, 1722. Le 11 mars 1736, il épousa Françoise Boucher de Boucherville. Le 11 mars 1741, on le dit

¹ On trouvera des renseignements biographiques sur la plupart des notaires mentionnés ci-dessus, dans l'excellente *Histoire du notariat*, de feu J.-Edmond Roy.

“écrivain aux magasin du roi.” D’après Tanguay, VI, 264, il fut propriétaire du poste “Gros Métina.” Sépulture à Québec, 27 mars 1742.

Claude Chéteineau de Rousselle, 1727-1728. Il était huissier au Conseil supérieur, à Québec.

Joseph Réaume, praticien, 1728.

Gabriel-Antoine Socquard de Villers, praticien, 1729.

Charles Ruette Dauteuil, écuyer, sieur de Monceaux. Il signe Dauteuil fils, 1731.

Louis Duserin, 1733, clerc.

Simon Mongineau, 1733. Plus tard, il fut bedeau de Notre-Dame.

Charles Macarty, procureur de Jean Butler, banquier de la Rochelle, 1733.

François-Charles Havard de Beaufort dit l’avocat, 1736. En 1742, 30 juin, etc., il subit un procès resté fameux dans nos annales, car il s’agit de l’affaire du *crucifix outragé* sur laquelle Faucher de Saint-Maurice a fait une conférence dont le texte est reproduit dans *Choses et autres*, pp. 205 à 221. Mais l’auteur, nous ignorons pourquoi, a déformé le nom du coupable, en l’appelant *Flavart de Beaufort de Ladvocat*.

L’accusé en 1736 comme en 1742 signe, bien lisiblement, Havard et Havard de Beaufort.

Quant à *L’avocat*, c’est un surnom qui lui fut probablement octroyé parce qu’il était procureur-postulant, à l’occasion.

Jean-Baptiste Henry de Rheims, 1740-1745. Écrivain.

En 1752, 24 février, il est témoin dans un acte sous seing privé fait au Lac des Deux Montagnes et le 29 mars 1753, il est procureur devant la justice seigneuriale de l’île Jésus.

Jean-Claude Panet, procureur le 9 mars 1743. A cette date, il déclare qu’il part de Montréal pour Québec où il va poursuivre devant le Conseil supérieur l’inscription en faux intentée par Guiton de Monrepos contre le sieur de Charly.

Jean-Claude Panet fut notaire à Québec de 1745 à 1775.

Claude-Antoine de Bermen, écuyer, sieur de la Martinière, capitaine, 1743-1744. Fils du conseiller Claude. Voir Tanguay, II, 237.

Jean Eynard, écrivain, 1744-1745. En cette dernière année, il fut accusé avec l’huissier Guyart d’avoir fait brûler les documents d’un procès. Le tribunal le condamne aux dommages et défense lui est faite de pratiquer comme procureur.

Eynard n’avait alors que 20 ans et il était natif de Paris.

COMMISSAIRES.

Jean-Louis de la Corne, écuyer seigneur de Chapt, major des troupes, commissaire du conseil établi pour la connaissance des désobéissances des coureurs des bois, aux ordres de Sa Majesté. Doc. du 1^{er} juillet 1724.

François-Étienne Cugnet, premier conseiller du Conseil supérieur de Québec, commissaire dans le procès des Frères Hospitaliers contre leur fermier J. B. Bertrand. Doc. du 14 janvier 1734.

François Daine, secrétaire du roi, greffier en chef du Conseil supérieur de Québec, commissaire dans l'affaire André Souste, marchand contre Joseph-Charles Rimbault de Piémont, notaire à Montréal. Doc. du 29 août 1736.

SUBDÉLÉGUÉS DE MONSIEUR L'INTENDANT.

L'intendant étant chef de la justice en la N^{ouvelle-France}, son subdélégué à Montréal décidait sommairement de certaines causes.

Les subdélégués étaient ordinairement commissaires-ordonnateurs, mais il arrive parfois que des juges ou des seigneurs du gouvernement de Montréal, remplissent l'office. D'après Doutre et Lareau, il y eut parfois deux subdélégués, à Montréal.

En autant que nous pouvons le constater, les subdélégués furent :
M. Boucher, écuyer, sieur de Boucherville, 4 juin 1672.

M. Migeon de Branssat, 11 septembre 1685.

Mathieu Gaillard, commissaire-ordonnateur, 1686-1690.

M. Fleury Deschambault, novembre 1692.

Pierre Rimbault, procureur du roi puis juge, 1716 à 1730.

Michel de la Rouvillière, commissaire-ordonnateur, 1731 à 1747.

Jean-Victor Varin, commissaire-ordonnateur, 1749 à 1755.

Pierre-Michel Martel, commissaire-ordonnateur, 1757.

GREFFIERS DES SUBDÉLÉGUÉS.

Prennent ce titre :

Bénigne Basset, notaire, etc., 1686 à 1690.

Christophe-Hilarion du Laurent, 1723 à 1727. Voir son nom dans la liste des greffiers intérimaires.

Guillet de Chaumont, notaire, 1729.

MARÉCHAUSSEE.

La maréchaussée fondée à Québec en 1677, eut un poste à Montréal dès 1679 et François-Marie Bouat, plus tard juge, semble en avoir eu la direction avec le titre de "lieutenant du grand prévost des maréchaux," dès 1709, sinon avant.

Nous avons résumé les pièces que nous possédons sur ce corps dans le *Bulletin des recherches historiques*, 1916, p. 16 et nous croyons inutile d'y revenir ici.

DIVERSES JUSTICES SEIGNEURIALES DU GOUVERNEMENT DE MONTRÉAL.

L'existence d'une justice royale à Montréal n'empêcha pas la création de justices seigneuriales dans le district, comme nous le constatons par les documents.

ÎLE JÉSUS.

Une pièce du 21 juin 1734, nous informe qu'il y avait un tribunal dans l'île Jésus et qu'à cette date, c'était le notaire René Gaudron de Chevreumont qui occupait le siège de juge.

En 1744, (3 juin) le juge seigneurial était J. B. Angers, arpenteur, le greffier, C.-F. Coron, notaire, et le procureur fiscal, M. Parant.

D'autres pièces nous font voir que cette cour fonctionnait encore en 1755.

BOUCHERVILLE.

Feu J-Edmond Roy, dans l'*Histoire du notariat*, I, 208, démontre qu'il existait une justice organisée dans Boucherville, dès 1671 "et que le juge, en cette année, était René Rémy." Le 25 juillet 1699, le notaire Marien Tailhandier est nommé juge de cette même seigneurie. Nous ne trouvons mention de cette justice, ensuite, qu'en 1739, alors que diverses pièces des mois de mars et mai nous procurent les informations suivantes: Les seigneurs de Boucherville, Pierre Boucher et Jacques Danneau de Muy demandent au lieutenant général, civil et criminel de Montréal de confirmer les nominations qu'ils viennent de faire au tribunal de leur seigneurie et qui sont M. Danré de Blanzky comme juge et M. Jacques-François Leber, comme procureur fiscal. Celui-ci ayant donné sa démission, il est remplacé en 1740 (30 mai) par M. Charles Rinvill.

TABLE DES MATIÈRES.

	Pages
Première partie:	
Justice seigneuriale.....	273
Les officiers: Juges, baillis.....	274
Juges intérimaires.....	275
Procureurs fiscaux.....	275
Substituts des procureurs fiscaux.....	276
Greffiers.....	276
Greffiers intérimaires.....	277
Huissiers et sergents du bailliage.....	278
Géoliers et concierges de la prison.....	279
Assesseurs.....	279
Interprètes.....	280
Tabellions et notaires.....	280
Deuxième partie:	
Première justice royale ou sénéchaussée.....	282
Officiers: Juge.....	282
Procureur du roi.....	282
Greffiers et notaires.....	282
Sergents royaux.....	282
Troisième partie:	
Deuxième justice royale ou prévôtée.....	283
Officiers: Lieutenants généraux.....	284
Lieutenants intérimaires.....	285
Lieutenants particuliers.....	285
Procureurs du roi.....	286
Procureurs du roi intérimaires.....	286
Greffiers.....	287
Greffiers intérimaires.....	287
Greffiers des conseils de guerre.....	289
Huissiers royaux.....	289
Géoliers et concierges des prisons.....	294
Assesseurs.....	294
Interprètes.....	295
Notaires royaux.....	295
Procureurs postulants.....	299
Commissaires.....	301
Subdélégués de M. l'Intendant.....	301
Greffiers des subdélégués.....	301
Maréchaussée.....	301
Diverses justices seigneuriales du gouvernement de Montréal:	
Ile Jésus.....	302
Boucherville.....	302

Transactions of The Royal Society of Canada

SECTION II

SERIES III

DECEMBER 1916

VOL. X

The Canadian Snowshoe.

By THOMAS DRUMMOND.

Presented by DUNCAN C. SCOTT F.R.S.C.

(Read May Meeting, 1916.)

It is impossible to give definite historical information about the Canadian snowshoe before the advent of the whiteman, and nothing absolute can be said as to its origin. Indian legends however tell us something about the subject, and one of these legends in a condensed form is given.

"In the winter when the swamps and muskegs and barrens harden in the cold, and the lakes congeal into ice, and the ground is covered with a thick mantle of snow, then the Wendigo, the cannibal frost-fiend, holds sway, and he skims swiftly over the surface of the snow on his fleet snowshoes carrying cold and terror wherever he goes. He watches for the lone hunter or trapper who, belated in the woods, makes camp at nightfall, cleans the snow away, spreads balsam boughs upon the ground and rests before a cheerful fire. After darkness comes the moon, and the air becomes colder and colder as it rises, the frost crystals sparkle like diamonds in the bright light, the northern lights rush crinkling across the sky, and the trees crack and snap in the clear frosty air like the discharge of artillery. Then the poor mortals shiver with fear and they say the Wendigo is abroad, and they pile wood upon the dying fire to keep him away till the morning comes, when the fiend retires baffled and defeated."

The snowshoe naturally originated in rude forms and in these rude forms is known elsewhere than in North America, as for instance in Norway and northern Asia. Very primitive forms are also reported from Japan, Korea and The Caucasus. These latter appliances are what might be called emergency snowshoes, roughly and quickly made for special and exceptional cases where heavy snowfalls have occurred in unusual places, and they are interesting as examples of the ingenuity of different aborigines under independent conditions. They

are necessarily rude and have remained so, and they have no bearing upon the development of the snowshoe which has taken place in Canada, for the finished article is only to be found where there is a definite winter of deep snow, and where they are in common use as the only means of moving about during that season. It is therefore fair to consider that there was an absolute and independent origin of the snowshoe here and at a very early date.

In Europe and Asia appliances for travelling over the snow have taken the form of the ski, and the development has been along that line, but in Canada and in the bordering lands for various reasons the development has been altogether along the lines of the webbed snowshoe.

Canada is a vast territory consisting of woodland, park and open country, and it includes the Laurentians, the Rocky mountains and the barrens of the far north. In such a vast country widely varying snow conditions are to be found.

The North American Continent was peopled by numerous and distinct groups of Indians divided into different linguistic stocks, who from central points spread themselves over the whole country from the Atlantic to the Pacific, and as far north as the Arctic. Nothing definite can be said as to their origin but it can safely be said that they are known to be a race of very great antiquity.

These different groups or stocks had snowshoes peculiar to themselves, in size, form, turn-up and method of weaving the netting. It is proposed to treat the subject from this point of view by giving descriptions and examples of most of the principal types. Other branches of the subject will be taken up later on in the article.

The principal Indian stocks from a snowshoe point of view are as follows:—

ALGONKIAN. Certain Virginian tribes and other American tribes near the International Boundary and in the Western States, Canada from the Atlantic Ocean to The Rocky Mountains and from the International Boundary northward to the latitude of Hudsons Bay.

ATHABASKAN. Interior of Alaska and Canada north of the Algonkians and west of Hudsons Bay.

ESKIMOAN. Arctic coast of North America and islands, also Greenland and part of the Arctic Coast of Asia.

IROQUOIAN. Region of great lakes, both sides of the St. Lawrence to the Saguenay and Gaspé coasts. New York State, Quebec, Ontario and part of the Western States.

SALISHAN. Most of the British Columbian Indians and various tribes to the south of the International Boundary.

SIOUAN. The basins of the Missouri and upper Mississippi between Latitudes 39 and 49 and between Longitudes 89 and 110.

TLINGIT. Alaskan coast and adjacent islands and a small part of Western Canada.

The subdivision into tribes is as follows:—

ALGONKIAN.

Abenaki	Quebec, Maine and New Hampshire.
Algonquins	
Blackfoot	Western Canada.
Bloods	Western Canada.
Cree	Canada.
Delaware	Canada and Eastern States.
Malecites	New Brunswick and Quebec.
Micmac	New Brunswick and Nova Scotia.
Mississauga	Canada.
Montagnais	Quebec and Labrador.
Naskapi	Labrador.
Ojibwa	Eastern Canada and The States.
Ottawa	Canada.
Peigan	Western Canada.
Potawatomi	Canada and State of Michigan.
Passamaquaddy	Maine.
Penobscot	Maine.

Also Arapaho, Cheyenne, Menomini, Sac, Fox, Kickapoo and other tribes of American Indians outside of the snowshoe belt.

ATHABASKAN.

Babines	Babine Lake, British Columbia.
Beavers	Peace River.
Carriers	Western Canada.
Cariboo Eaters	Western Canada.
Chilcotin	British Columbia.
Chipewyan	Lake Athabasca.
Dog Ribs	Great Bear Lake.
Kaiyuhkho'tenne	Yukon River Alaska.
Kuyukukho'tenne	Yukon River Alaska.
Kutchin	Including various interior Athabaskan tribes.
Hares	Great Bear Lake and north.
Nahane	Stikeen River British Columbia
Sarcee	Western Canada.

ATHABASKAN—Continued.

Sekane	Findlay and Parsnip Rivers.
Slave	Great Slave Lake.
Tahltan	British Columbia.
Yellow Knives	Great Slave Lake.

Also Navaho, Hupa, Kiowa and other American Indian tribes outside of the snowshoe belt.

IROQUIAN. Various tribes of 6 Nation Indians in Quebec, Ontario, and New York State; also other tribes in North Carolina, Wisconsin and Oklahoma.

SALISHAN. Bella Coola, Lillooet, Okanagan, Shuswap and Thompson River Indians of British Columbia, and other bands in British Columbia and the United States.

TLINGIT. Chilcat, Tlingit, Yukutat, Sitka and other bands on the Alaskan Coast.

ESKIMOAN.

Aleuts
Central regions
Labrador
Alaskan
Greenland
Arctic Islands
Northern Asia
Mackenzie River

For convenience of description the country is divided into eastern woodland, plains, plateaus and Mackenzie river, Arctic and North Pacific Coast.

The Eastern Woodland Belt is thick forest with fallen timber and underbrush. Where the snowshoe is in common use the snow is deep and soft. It includes Newfoundland, Nova Scotia, New Brunswick, Maine, Ontario and the northern part of New York State.

The Plains Belt takes in the plains proper and the adjoining park country as comprised in Manitoba, Saskatchewan, Alberta and some of the country to the south of the International Boundary. The snowfall is lighter but it is wind driven, hard and dry.

The Plateaus Belt is largely woodland, thinning out in the north into The Barrens. It includes British Columbia, Alaska, The Yukon and the Mackenzie River Basin, with the contained Rocky Mountains. It is a varied country as regards topography and snowfall.

The Arctic Belt takes in the Arctic coast and islands, and also parts of the Alaskan and Atlantic coasts. It is more or less woodless except for willow and alder in the river valleys. The snow is drifted and hard.

The snowshoe is used in the State of New York and in other parts of The States bordering upon the Canadian line, but, as no distinct types can be found and as the snow is not very permanent, it is assumed and reasonably so, that it is an intrusion at these points from The Canadian Algonkian Indians.

In separating the snowshoe into its types various considerations are to be taken into account, such as snow conditions, available material, frame, number of cross-bars, outline and shear, and webbing and size.

The snowshoe may be flat or turned up, it may be pointed at both ends, round, oval, lenticular, of the beaver-tail type, or as in common cases, have the ordinary trailer. The frame may be of one or two pieces, rectangular, round or oval in cross-section, and with or without a wedge-shaped keel on the inside. When hardwood is available for the frame it allows of more elaborate shaping, and neater forms are the result. There may be from none to two or more cross-bars, but if there are more than two their main use is as spreaders. The usual arrangement is two cross-bars, and this divides the snowshoe into three spacings namely toe, foot and heel.

There are three kinds of mesh namely hexagonal, rectangular and irregular, and the toe and heel netting is usually made of finer material. In certain types the toe and heel netting is absent, as will be seen later on.

There are four methods of attachment of the netting to the frame (1) by a string passing along the inside of the frame in a series of loops one to two inches long. The holes through the frame where the loops join are V-shaped, about $\frac{1}{2}$ inch apart on the inside and coming together just under the outer surface. One hole is bored in a slanting direction through the frame from the inside and the other arm of the V is started in the same hole outside and bored back again; the string being passed from the inside through the frame then back again, knotted and looped to the next set of holes, and so on around the frame. This leaves a looped string on the inside of the frame with no cord projections on the outside. The attachment to the cross bar is either by a looped string as described above, or through vertical holes or slots or around the cross-bar. This is the Algonkian method. (2) In the Athabaskan type the attachment in the toe and heel spaces is also made with a looped string, but the hole is vertical through a wedge-shaped keel on the inside of the frame as in the lacrosse stick,

and looped around the inside of the frame as above. The Athabaskan snowshoe is made with a two-piece frame spliced in front into a rounded form; the loops go into the turns of the splicing and avoid the vertical holes there. (3) The hexagonal mesh in the foot-space, Algonkian type, is around the frame in a series of hitches or turns. This is sometimes used in the Athabaskan type when the foot-space is netted with hexagonal mesh. (4) In the Eskimoan type with rectangular and irregular meshing the transverse strands pass through horizontal holes in the frame, and at right angles to it, say, across the spacing from one side of the frame through the hole on the other side from inside to outside, then along the outside of the frame to the next hole and back again through it to the corresponding hole in the other side of the frame, and so on till the spacing is filled up. The longitudinal strands are attachments to the cross-bars either through slots, holes or around the cross bars.

In addition to the difference in meshing and the method of attachment to the frame, there are distinctions in the way of shape and turn-up which make fairly typical tribal forms, but, as will be seen later on, these tribal forms are somewhat complicated by transitions.

The typical Eskimoan snowshoe has the rectangular or irregular mesh in which the strands pass through the sides of the frame. The shoe is pointed at both ends, made of two pieces, has two cross-bars and is well turned up in the front. The netting in the toe and heel spaces is either wanting or very irregular and rudimentary. As the snow is hard in the Arctic regions the snowshoe is short, and it usually has a string from the toe to the front cross-bar. It is illustrated by figures 6 and 7 in plate 1. Figure 6 represents the typical form, and the same shoe is used by the Siberian Eskimo. It is from the Alaskan coast but the exact locality is unknown. The example is 30 inches long and 9 inches wide. It has rudimentary netting in the toe and heel spaces and it is well turned up in the front.

Figure 7 represents an almost flat form from the mouth of the Yukon. The length is $36\frac{1}{2}$ inches and the width $9\frac{1}{2}$ inches. It apparently had rudimentary netting in the toe and heel spacings which is now destroyed, and it is probably a transitional form. The Eskimo now use the more finished shoe of the Athabaskans as shown in plate 2.

The rectangular Athabaskan form is long and narrow, turned up in front and usually right and left. It has a two-piece frame neatly spliced in front, bent into a rounded form and finished up with a trailer behind. Very often there is a string from the toe to the front cross-bar and it almost always has an extra cross-bar in the heel spacing which is knitted into the mesh. The toe and heel netting

is in hexagonal mesh attached to the frame through vertical holes in a keel, as described above. The foot-netting is rectangular in most of the examples given in plate 2 which illustrates this type, and shows a number of distinctive shapes and forms peculiar to different localities along the Alaskan coast. Most of the examples in this plate are from the fine collection of the Smithsonian Institute in which this particular type is well represented. The writer has never seen this shoe in use and knows it only from specimens. The rectangular foot-netting is reported to be peculiar to the Alaskan coast west of the Yukon drainage, and the hexagonal foot-netting to the interior east of this. The writer would judge from this that the true Athabaskan type had hexagonal foot-netting as shewn in figure 2, plate 2, in which case the other examples are transitional forms between the Eskimoan and Athabaskan forms. Many of these shoes are neatly made and ornamented with tufts of wool.

Figure 1 is a Bristol Bay type 44 inches long and $9\frac{3}{4}$ inches wide. It is spatulate in form, well turned up in front and the outline is modified by each cross bar.

Figure number 2 was obtained at Sitka, Alaska, but it is reported to be from the interior in the direction of the headwaters of the Yukon River. Its main peculiarity is the hexagonal foot-netting, looped around the frame as in the ordinary Algonkian type, but more roughly. The length of this snowshoe is not given.

Number 3 came from Norton Bay, Alaska. It is 46 inches long and $10\frac{1}{2}$ inches wide. The two shoes represented by this specimen are made in rights and lefts. The filling in the toe-space is hexagonal, and from the description it is attached to the frame in Algonkian style. The foot-spacing is square-woven and quite rough. The peculiar arrangement in the heel spacing is shown in the figure.

Number 4 is 48 inches long and 11 inches wide. It is a wide variety well turned up at the toe. The attachment is Athabaskan throughout, and it is a good specimen of weaving. It is reported to have come from the Chilkat and the netting is made of sinew twine.

Specimen number 5 is a Kutchin shoe from some point well into the interior but not exactly known. It is a fairly good shoe presenting some peculiarities in the weaving of the toe-netting. The three crosses would indicate the maker to be from the vicinity of some of the interior Canadian Missions.

Number 1, 2, 3 and 4 are from The United States National Museum. Number 5 is from The Victoria Memorial Museum, Ottawa.

This Athabaskan type of shoe is apparently exclusively used by the Athabaskan Indians of Alaska. It is also used by the Canadian Athabaskan Indians of the Yukon, the Mackenzie River Basin and the interior of British Columbia. The Western Cree type of shoe (Algonkian) has replaced this form among various tribes of the Canadian Athabaskan Indians of the interior, and it is difficult with our knowledge of these Indians to state whether this change has occurred only locally or has been more or less complete.

The typical Western Cree type (Algonkian) is long and narrow and made up of a two-piece frame pointed at both ends and well turned up in front. It often has a string from the front point to the front cross-bar, and from one to three cross-bars as spreaders in the toe-spacing, which cross-bars are usually circular in cross-section and not knitted into the netting; sometimes also it has an extra cross-bar in the heel-spacing. It has the usual Algonkian hexagonal netting and attachment to the frame, and the two shoes representing the pair as in the case of long snowshoes are usually made in rights and lefts. It is illustrated in plate 3.

Figure 1 in this plate is Western Cree from Manitoba. It is 6 feet long and 15 inches wide with an extra cross-bar in the heel spacing which is knitted into the netting and another in the front space which is not, and it also has a twisted rawhide cross-string in the front. It belongs to the Montreal Amateur Athletic Association. The Indians in the vicinity of Winnipeg are said to have had several pairs of snowshoes in use, one pair the height of a man, of which this is an example for long trips while shorter shoes were used around home and for shorter trips.

Number 2 is Western Cree from Pembina River some 70 miles west of Edmonton, Alberta. It is 54 inches long and $12\frac{1}{2}$ inches wide, made in right and left with turned-up front, and two spreader cross-bars in the front spacing.

Number 3 is from the Mackenzie River Basin east of the Rocky Mountains, the exact locality being unknown. It has a two-piece frame neatly spliced in front in Athabaskan style but the turn-up in front instead of being long and gradual as in the above type is short and abrupt so that the turn-up points backward past the right angle. It has the hexagonal mesh and Algonkian attachment to the frame but the latter is oval in cross-section, and fuller in the centre than at the ends. It is an interesting example and the only one of the kind ever seen by the writer. In all probability it is a transitional form between Athabaskan and Western Cree types.

Number 4 is Western Cree from Lake Athabasca, 56 inches long and $13\frac{1}{2}$ inches wide with a two-piece frame, pointed fore and aft and

well turned up. It has one cross-bar in the heel-spacing and three in the toe, and it is ornamented with tufts of wool.

Number 5 is a Chipewyan snowshoe from Fond du Lac, $37\frac{1}{2}$ inches long and 8 inches wide, right and left but not markedly so and well turned up. It shows an extra cross-bar in the toe-spacing and also a twisted rawhide thong. The Chipewyans are Athabaskans but the shoe in common use has conformed to the Western Cree type. The Carriers of Stuart Lake, British Columbia are also Athabaskans, According to Father Morice they have four kinds of snowshoes.

KHE LA PAS, (rounded mocassin). The same type as the Algonkian snowshoe in plate 4.

LET'LU. (stitched together). The pointed Western Cree type, which was introduced about 40 years ago and came into common use.

AIH ZA. (snowshoe only). The typical Athabaskan shoe.

SESKHE. (black bear foot). Oval willow frame, single cross bar, and rough netting.

Number 6 is a Sioux snowshoe from an unknown locality. It is 33 inches long, $8\frac{1}{4}$ inches wide and it has two cross-bars in the toe space. It conforms to the usual Western Cree standard.

It might be stated that this Western Cree snowshoe is the best type made, and this is evidenced by the large area over which it is in use, practically westward from Winnipeg to the interior of British Columbia and north almost to the Arctic Ocean. It has largely replaced the Athabaskan types east of the Rocky Mountains, especially where these people lived along the Hudson's Bay Company trade routes to the far north, as in the case of the Chipewyans, Carriers and other Athabaskan tribes. It is used in the interior of British Columbia by the Fort George Indians (Athabaskans) where the snowshoe is much turned up in the front so that the point strikes the shin at each step. In the spring-time when travelling in wet snow, these Indians are said to re-string the foot netting in the evening to keep it tight. This shoe is especially suited for walking on crusted snow.

The type of snowshoe used by the Eastern Woodland Indians is represented by plate 4, an Ojibwa Algonkian type. Figures 1, 2, 3 and 4 represent the common forms. They are flat shoes of the one-piece frame type with 2 cross-bars and a hardwood frame. They are bent into a wide shape with a long trailer. The bend in front varies, and it is said to be somewhat distinctive as to locality. They are neatly made and often ornamented with tufts of wool and coloured cloth, and also by working patterns into the webbing, as in figure number 1, which is 45 inches long by 21 inches in width. Specimen number 2 is 40 inches by $17\frac{1}{2}$ inches, and number 3 is 36 inches long

by $14\frac{1}{2}$ inches wide. Numbers 1, 2 and 3 belong to various clubs and private collections in Montreal. Number 4 belongs to the Varden collection of the United States National Museum. The size is not given but in form it is narrower than the other varieties. It is a very old snowshoe and has several peculiarities, but the main characteristics are the same.

Numbers 1 and 4 would appear to represent extremes in this type and gradations between are well represented by numerous examples which are not figured in the plate. Number 5 is a Huron Snowshoe from Lorette, Quebec. It is 35 inches long by 16 inches wide and is perhaps a modern shoe. It is somewhat peculiar in shape and is possibly a transition between the Ojibwa and Montagnais snowshoe.

The Montagnais and Naskapi Indians of Quebec and Labrador Peninsula have snowshoes peculiar to themselves as shown in plate 5. There are 5 varieties, namely the Beaver tail, the Swallow tail, the two-bar oval, and the single-bar oval, (1) with the bar in front (2) with the bar in the middle under the foot. Number 1 is the Beaver-tail type, the example is 27 inches long and 26 inches wide. Figures 2 and 2a show examples of the Swallow-tail variety, number 2 is 36 inches long and $21\frac{1}{2}$ wide, number 2a is $37\frac{1}{2}$ inches long and 20 inches wide. Figure 3 shows the oval two-bar variety, the example being 24 inches long and 17 inches wide. In this particular example a rawhide covering has been put on at the sides of the foot-spacing to protect the attachment to the frame. In the wider varieties of these snowshoes the cross-bars are curved. Figures 4 and 5 represent the single-bar variety, number 5 being the common form. Figure 4 has no toe-hole and the attachment to the foot is made by thongs through the eyelet holes. These latter two specimens are taken from the eleventh Annual Report of the Bureau of Ethnology.

All of these Eastern Woodland types are flat and wide with a good bearing surface suitable for travelling on the soft snow of the woods. They are usually very neatly made and are also symmetrical.

Various rough types of snowshoes are given in plate 1. Figures 1, 2 and 3 are called Emergency Snowshoes and are interesting as examples of what can be done with the available material at hand when caught in the woods in a sudden snowstorm. Number 1 is made from a slab of bark stiffened and strengthened by sewing a willow frame around the edge with withy thongs. It is 30 inches long and 10 inches wide. Number 2 is made by bending a sapling frame into the ordinary trailer form and filling in with netting made from withy thongs. It is $30\frac{1}{2}$ inches long and 11 inches wide. The

netting is interesting, being made in rectangular mesh which is unusual in the East. It was probably adopted in this case because it is an easier type of mesh for the material used. Numbers 1 and 2 are of Iroquois origin and come from Brant County, Ontario. Number 3 is 30 inches long and 9 inches wide. It is made of spruce boards sewed together with thongs. It is of Algonkian origin and comes from Maniwaki, Quebec. Figure 4 is interesting as being the only figured example of the Salish type of Snowshoe. It is 24 inches long and $13\frac{1}{2}$ inches wide, and has a rough sapling frame bent into an oval form. The netting is rather roughly made with coarse thongs doubled and twisted on each other. It is somewhat irregular, has long slings to the frame and a small netted foot-space. It is a little turned up in front, and it comes from Lillooet, British Columbia.

Figure number 5 is a very irregular and rudimentary form from The Ute Indians of Utah. It is included here as representing a type found in British Columbia which is figured in mesh and netting by number 4 and in outline by this number 5. This British Columbia shoe is locally known as The Bear-Paw snowshoe. It has little bearing surface for soft snow but is useful for steep climbing in the spring when the snow is hard and firm. The Bear-Paw snowshoe is also Salishan.

The Tlingit apparently have no type peculiar to themselves. They are said to use the Athabaskan shoe of Alaska and the interior.

The foregoing examples show the types of snowshoes used by the various tribal groups of the North American Indians. The record is probably incomplete for the Salishans but fairly comprehensive for the others.

The examples given illustrate the standard types of the different Indian Stocks, but it is to be remembered that there are endless variations from these in the way of width, length, turn-up, outline, material used in the netting, neatness and the peculiarities of individual makers. There are also transitional forms brought about by intercourse between the various tribes. It is considered that most of these changes have occurred in recent times and that the figured examples represent the older types and forms of the snowshoe.

Plate number 6 gives examples of the modern club snowshoe. The modern club snowshoe, which is somewhat turned up in front does not correspond exactly with any of these old eastern forms, at least the writer has been unable to find any prototype, so it is assumed that they are innovations introduced for racing purposes when snowshoeing became a popular sport.

Varied forms of the modern snowshoe are now being introduced as novelties, and many of the older forms are being copied and reproduced.

The common and usual filling for snowshoes is the so-called gut more properly known as babiche. Animal rawhide with the hair removed is soaked in water, cut around and around with a knife to the size required, stretched, dried and rolled into balls ready for use. In the better kinds of babiche the parchment is treated so as to make it clear and transparent. Seal thong, twisted thong and sinew are used for the same purpose.

It is known that snowshoes were in existence long before the whites appeared in America, but very little definite information can be given as to their form and finish. It is reasonable to suppose that the form types were about the same then as now but that the principal development in finish and neatness has occurred since the time of the whiteman, for with the introduction of the steel knife and axe it can easily be seen that much could be done in the way of improvements. A study of old French archives for information upon this point would be of historical interest and importance.

Having given a description of the various types of the Canadian Snowshoe, it is perhaps not out of place to say something about its use and application. Some people know the snowshoe simply from the sporting point of view and can recall pleasant evenings spent in that way, but nothing more. Many of us, however, know it from the true point of view as a means—in fact the only means—of travelling about in the wilds during the winter season.

Looking at the question from this point of view the Canadian Snowshoe is of national importance and it has materially aided and hastened the development of our country. It has been used in a **military way**, in an **exploring way**, in an **engineering way** and in the **ordinary avocations of life**.

In a **military way** the snowshoe was largely used in the early history of Canada, first in the border wars between the Hurons and Algonquins who were Allies of the French, and the Iroquois who were Allies of the British, and afterwards between the French and the Iroquois and the French and the British.

In the Huron Iroquois War which lasted for nearly 100 years and which resulted in the scattering and practical extermination of the Hurons, the snowshoe was largely used in winter forays, and several notable examples are given.

Ville Marie near Montreal was raided by the Iroquois in the winter of 1644 and the fort was nearly captured. The Indians who used snowshoes in the attack were defeated by Maisonneuve after a fierce fight, and had to retreat.

In the winter of 1649 the Iroquois undertook an expedition against various Huron Mission Towns near the site of the City of Orillia,

Canada. In the beginning of the winter the Indians started from the Hudson River in the State of New York and travelled on snowshoes around the head of Lake Ontario to St. Ignace, a distance of about 500 miles. St. Ignace was surprised, burnt and destroyed and the inhabitants tortured and massacred. St. Joseph and other mission towns suffered the same fate. At Ville Marie (not the place mentioned above) which was fortified the Iroquois were defeated and forced to retreat.

To stop the incursions of the Iroquois, the French Governor De Courcelles on January 9th, 1666 set out from Quebec for the Indian stronghold with 500 men on snowshoes, each man carrying his blankets, accoutrements and food. They travelled up the St. Lawrence and Richelieu Rivers and over Lakes Champlain and George. Conquered more by the elements than by the Indians they were forced to retreat without success, after having travelled over 1,000 miles and lost many men through cold and exposure.

In the early spring of 1686 Troyes and St. Helene with a company of men on snowshoes travelled 600 miles to Hudson's Bay and captured the posts there.

In 1690 Frontenac organized three expeditions against the Iroquois which were undertaken in the winter upon snowshoes so that the Indians might be surprised. One started from Montreal under the command of St. Helene and burned and destroyed Schenectady in the State of New York. On its return it was pursued by the Indians almost to the gates of Montreal and in the last fight near the latter place a number of men were lost. A second party started from Three Rivers under Hertel and destroyed Salmon Falls, New Hampshire. The third expedition started from Quebec under Portneuf and the Fort at Casco Bay near Portland, Maine, was destroyed.

In 1697 D'Iberville with a command on snowshoes ravished the British settlements.

The treaty of Ryswick in 1697 ended this war but it broke out again in 1702, and practically ended with the conquest of Canada in 1759. During this time numerous expeditions on snowshoes were undertaken by both sides.

The snowshoe then has played an important part in the early Military History of Canada.

In an **exploring way** the snowshoe has been used on all the winter expeditions in British North America.

The fur-trading companies were the pioneers of our country and in their rivalry and search after fur-trade routes their representatives gradually pushed their way across the Continent. The annals of their adventurous travels make most interesting and instructive

reading, and the names of these early explorers should be written in large letters in the history of our country. Space here will only allow a few brief remarks upon two or three of the more well-known expeditions.

Sir Alexander Mackenzie in his famous explorations for the Hudson's Bay Company discovered the Mackenzie River in 1789 and descended it to the Arctic Ocean where he established posts and traded with the Eskimo and Athabaskan Indians. He made his well-known trip across the Continent to the Pacific Ocean in 1792-3. In the winter parts of these expeditions the snowshoe was in constant use.

Simon Fraser an explorer for the North-West Company established the first trading post in British Columbia in 1805 and descended the Fraser River to the Pacific Coast the following season. David Thompson another official of the same Company crossed the Rocky Mountains by way of Bow River in 1800 and descended to the Pacific Coast by way of the Thompson River, arriving at the Coast in 1811, after trading with the Indians and establishing posts on his way down. Snowshoes were most important on both the Fraser and Thompson expeditions.

Arctic research expeditions and their consequences introduced a new incentive for explorations. In 1819 Franklin took command of one of these expeditions by way of Rupert's Land. He spent the first winter on the Saskatchewan River. The following spring he descended the Coppermine River and surveyed the Arctic Coast eastward. He arrived at York Factory in 1822 after having travelled some 6,000 miles by land and water and Arctic ice, much of which was done by sled and snowshoe.

In 1825-27 Franklin undertook a second exploration, and mapped the Arctic Coast westward to the 150th Meridian. In this expedition he was accompanied by Richardson who was also a noted Arctic explorer.

In 1845 when in search of the North-West Passage Franklin was lost with his ships and crew. Numerous Franklin search expeditions were sent out by Britain and America, and these expeditions brought out many men who became famous as Arctic, and sub-Arctic explorers.

Dr. John Rae joined the Hudson's Bay Company in 1833. He undertook two expeditions in 1846-7, and in 1848 he accompanied Richardson in a Franklin search expedition. In 1853-4 he explored King William's Land, and in 1864 he made a telegraph survey from Winnipeg over the Rocky Mountains.

All these men, Franklin, Richardson and Rae, did most of their Arctic work through Hudson's Bay Company posts with dogs, sleds and snowshoes. They were well known in the west as famous travellers and expert snowshoers. Franklin's diary for several years is still at one of the northern Hudson's Bay Company Posts. It is related of Richardson and Rae that in their land travels with dog sleds and snowshoes less than 100 miles a day was considered a poor day's journey, and as the driver had to do all this distance on snowshoes he might reasonably be considered a qualified traveller.

The annals of many other famous pioneers of our country could be given, and they all add their testimony to the record of the service rendered by the snowshoe.

Most engineers can call to mind many occasions on which the snowshoe has been used in an **engineering way** as a means of accomplishing work which would have been impossible without it. In large and continuous work like the actual building of a railroad, horses are used because the construction work makes this possible, but, in winter preliminary railroad survey work, dependence must be placed upon the snowshoe for maintenance of transport and in the daily operations of the survey. It has been used in the winter surveys of all of the transcontinental and important railways of the country such as the Canadian Pacific, Grand Trunk Pacific, Canadian Northern, Intercolonial and other railroads. While upon this subject it might be stated that, upon one occasion at least during the days of the Government Canadian Pacific Railway surveys, parliamentary information about certain mountain passes became necessary. Engineers volunteered and the work was accomplished by means of the snowshoe.

I should like to make myself clear as to the importance of the snowshoe for I think it is not fully understood. At the beginning of the winter when the snow begins to fall, it is possible to move about without the snowshoe, but, as the depth increases this becomes more and more difficult, and travelling finally becomes impossible without its use.

Under such winter conditions the snowshoe is an engineering appliance of equal or even greater importance than the transit or level.

The snowshoe is used in the ordinary avocations of life as an aid to trade and barter, travel and transportation, the chase, lumbering, mining, distribution of mails, administration of justice in the far north, and in many other ways. In short, through it total isolation has been prevented in the winter, and the ordinary pursuits of life go on as usual; from this point of view alone it has been of great service to man.

In addition to the foregoing uses, snowshoeing flourished for many years as a very popular sport and a few words might be said about this aspect. The Montreal, the St. George and numerous well known French snowshoe clubs were formed, in which the aggregate membership list reached almost to army dimensions.

Annual racing meets were held by these clubs and the records for the regular distances are as follows:—

100 yards	11 $\frac{3}{4}$ secs.
120 yards hurdle	18 secs.
220 yards	26 secs.
440 yards	1 min. 07 $\frac{3}{4}$ secs.
880 yards	2 mins. 33 secs.
1 mile	5 mins. 40 secs.
3 miles	19 mins. 02 secs.
5 miles	33 mins. 49 $\frac{1}{2}$ secs.

The clubs had weekly evening tramps to some favourite resort where the evening ended with a supper enlivened with song and speech.

This article has given a fairly comprehensive description of the older standard types of the webbed snowshoe used in Canada and the bordering lands.

It has been shown that the use of the snowshoe has materially aided and hastened the development of our country, and enabled its inhabitants to live their ordinary life during the winter season.

Examples in proof of this have been taken from the past but it might be pointed out here that its use is not confined to the past, for in the wilds the snowshoe still holds winter sway and in these more restricted areas it yet remains a useful and necessary appliance to the pioneers of our country.

Figure 1. A traditional Salish snowshoe from the mouth of the Yukon River, Alaska. It is made of a willow sapling bent into the ordinary foot shape and covered with a rectangular mesh of withy bark. It is 12 inches long and 9 inches wide. It is a transitional form between Eskimo and Alaskan shapes. (Victoria Memorial Museum, Ottawa, Canada.)

Figure 2. A traditional Salish snowshoe from the mouth of the Yukon River, Alaska. It is made of a willow sapling bent into the ordinary foot shape and covered with a rectangular mesh of withy bark. It is 12 inches long and 9 inches wide. It is a transitional form between Eskimo and Alaskan shapes. (Victoria Memorial Museum, Ottawa, Canada.)

Figure 3. Emergency snowshoe made from spruce bark sewed together with a willow sapling bent into the ordinary foot shape. It is 12 inches long and 9 inches wide. It is a transitional form between Eskimo and Alaskan shapes. (Victoria Memorial Museum, Ottawa, Canada.)

Figure 4. Interior Salish snowshoe from the mouth of the Yukon River, Alaska. It is made of a willow sapling bent into the ordinary foot shape and covered with a rectangular mesh of withy bark. It is 12 inches long and 9 inches wide. It is a transitional form between Eskimo and Alaskan shapes. (Victoria Memorial Museum, Ottawa, Canada.)

Figure 5. A traditional Salish snowshoe from the mouth of the Yukon River, Alaska. It is made of a willow sapling bent into the ordinary foot shape and covered with a rectangular mesh of withy bark. It is 12 inches long and 9 inches wide. It is a transitional form between Eskimo and Alaskan shapes. (Victoria Memorial Museum, Ottawa, Canada.)

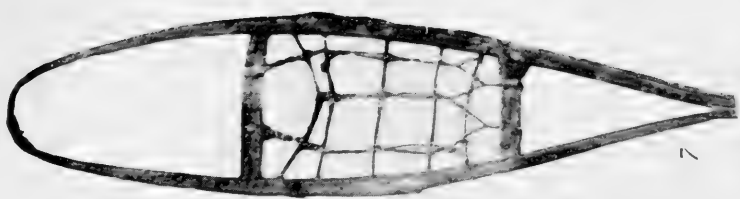
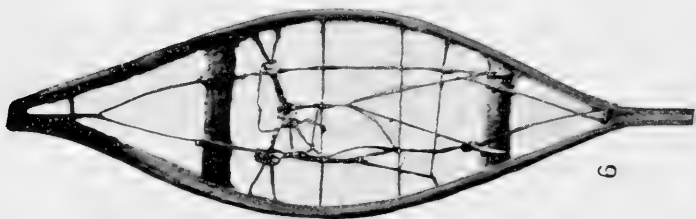
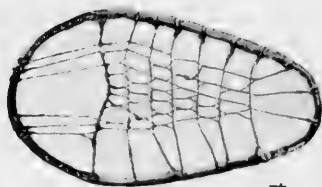
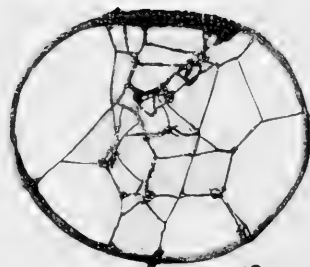
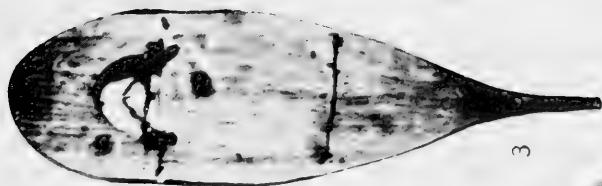
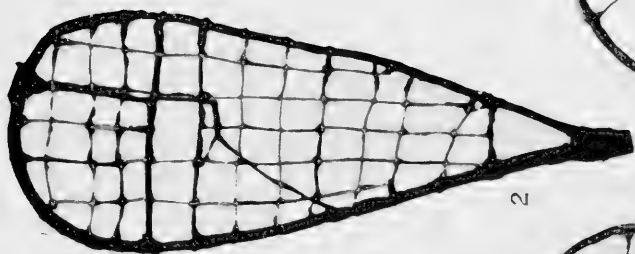
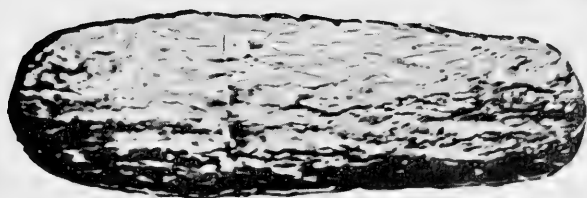
Figure 6. A traditional Salish snowshoe from the mouth of the Yukon River, Alaska. It is made of a willow sapling bent into the ordinary foot shape and covered with a rectangular mesh of withy bark. It is 12 inches long and 9 inches wide. It is a transitional form between Eskimo and Alaskan shapes. (Victoria Memorial Museum, Ottawa, Canada.)

Figure 7. A traditional Salish snowshoe from the mouth of the Yukon River, Alaska. It is made of a willow sapling bent into the ordinary foot shape and covered with a rectangular mesh of withy bark. It is 12 inches long and 9 inches wide. It is a transitional form between Eskimo and Alaskan shapes. (Victoria Memorial Museum, Ottawa, Canada.)

EXPLANATION OF PLATE 1.

- FIGURE 1. Emergency Showshoe made from a slab of bark stiffened with a willow frame 29 inches long and $9\frac{1}{2}$ inches wide. Of Iroquois origin, from Brant County, Ontario. Victoria Memorial Museum, Ottawa, Canada.
- FIGURE 2. Emergency Snowshoe made by bending a sapling frame into the ordinary flat trailer form and weaving a rectangular meshed netting of withy bark. It is $30\frac{1}{2}$ inches long and 11 inches wide. Of Iroquois origin from Brant County, Ontario. Victoria Memorial Museum Ottawa Canada.
- FIGURE 3. Emergency Showshoe made from spruce boards sewed together with thongs. It is of Algonkian origin from Maniwaki Quebec, and is $9\frac{1}{2}$ inches long and 9 inches wide. Victoria Memorial Museum, Ottawa, Canada.
- FIGURE 4. Interior Salish from Lillooet, British Columbia. It is 24 inches long and $13\frac{1}{2}$ inches wide and has coarse netting. It has a bent willow frame without cross bars, and is a little turned up in front. Victoria Memorial Museum, Ottawa, Canada.
- FIGURE 5. A rough Snowshoe from the Ute Indians of Utah with a bent willow frame, oval in outline. It is included here because it corresponds to a Salish Snowshoe from British Columbia which is represented by this number 5 in shape and by number 4 in mesh. This Salish snowshoe is locally known as The Bear Paw snowshoe. United States National Museum.
- FIGURE 6. Eskimo Snowshoe from the Alaskan Coast which is pointed at both ends and well turned up in front. It has 2 cross-bars and is 30 inches long and 9 inches wide. The foot netting is in rectangular mesh wove through the sides of the frame in Eskimo style as described elsewhere. Victoria Memorial Museum Ottawa Canada.
- FIGURE 7. Eskimo Snowshoe from the mouth of the Yukon River. It is nearly flat and $36\frac{1}{2}$ inches long and $9\frac{1}{2}$ inches wide. Foot netting in ordinary rectangular mesh. The toe and heel netting is destroyed but it was of a rudimentary form. It is a transitional form between Eskimo and Athabaskan shapes. United States National Museum.

PLATE 1.



United States National Museum.

United States National Housing

[illegible]

EXPLANATION OF PLATE 2.

Types of Snowshoe worn by Canadian and Alaskan Athabaskan Indians:—

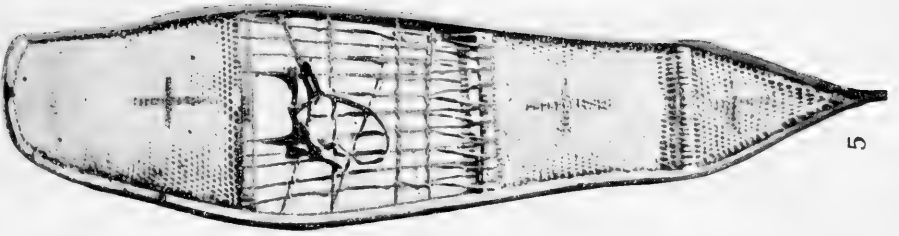
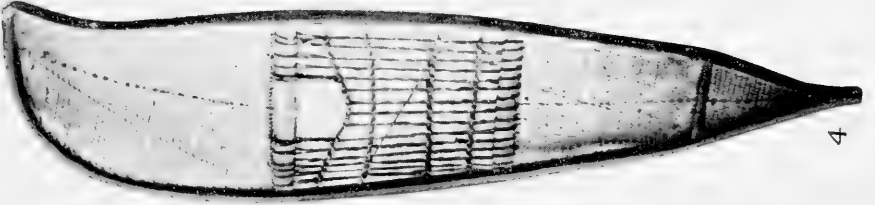
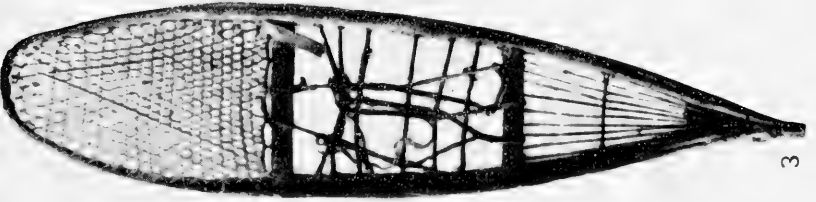
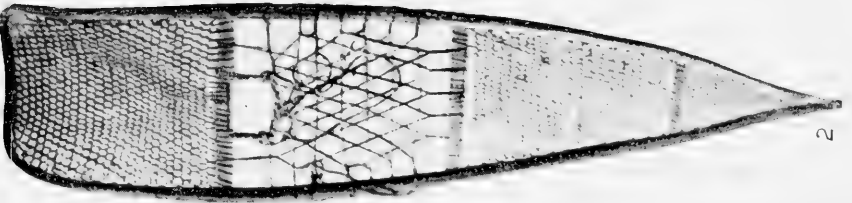
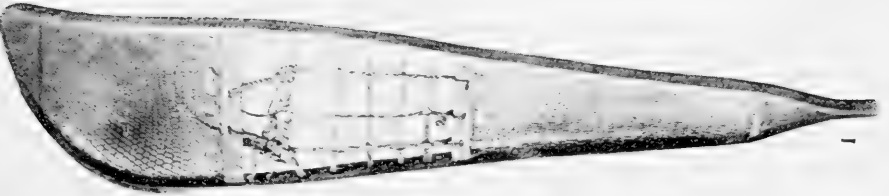
FIGURE 1. A Bristol Bay variety 44 inches long and $9\frac{3}{4}$ inches wide. It is spatulate in form, well turned up in front and the outline is modified by each cross bar.
United States National Museum.

FIGURE 2. Obtained at Sitka and said to have come from the interior near the head waters of the Yukon. Its main peculiarity is the hexagonal meshed foot-netting looped around the frame as in the Algonkian types.
United States National Museum.

FIGURE 3. From North Bay Alaska 46 inches long and $10\frac{1}{2}$ inches wide right and left foot shoes distinct. The filling in the toe space is attached in Algonkian style through V-shaped holes. The heel-space is filled with a series of longitudinal cords converging at the tail as shown in the figure.
United States National Museum.

FIGURE 4. This specimen is 48 inches long and 11 inches wide. It is short and wide and well turned up at the toe. The attachment to the frame is Athabaskan throughout and it is a good specimen of weaving. It came from Sitka, Alaska.
United States National Museum.

FIGURE 5. A Kutchin shoe from the interior country, the exact locality being unknown. The shoe is fairly well made and presents peculiarities in the weaving of the toe-spacing, part of it being in longitudinal filaments. From the three crosses it is judged that the snowshoe comes from the vicinity of some of the interior Canadian Missions.
Victoria Memorial Museum, Ottawa, Canada.



... of the Mountain Shoe ...
... and well turned up in front. From the Province of Manitoba, 6 feet long
and 1 1/2 inches wide. It has an extra cross-bar in both the heel and toe spaces
and is nearly made.

Mountain Shoe Club, Montreal.
... from Pombin River, Alberta. A two-piece frame
... and well turned up in front. 54 inches long and 1 1/2 inches
wide. It has an extra cross-bar in both the heel and toe spaces
and is nearly made.

Private Collection, Montreal.

FIGURE 3. Mackenzie River Basin, exact locality unknown. Symmetrical shoes
52 inches long by 1 1/2 inches wide. A two-piece frame spliced in front and bent
into a rounded form and finished with a leather binding. The bend in front
turns sharply upward at right angles. The frame is oval in cross-section,
tapers both ways from the middle and is nearly made. An interesting shoe
... a transitional form between Western Cree and Athabaskan types.
... Montreal Museum, Ottawa, Canada.

... the usual unsymmetrical double-pointed frame well turned up in front with
extra cross-bars in heel and toe spaces. Not nearly made and composed with
leather of wool.

FIGURE 4. ...
... 52 inches long and 1 1/2 inches wide.
... The shoes are right and left shoes with extra cross-bars in
both the heel and toe spaces. The length is 52 inches and the width 8 1/2 inches.
... Collection, Montreal.

EXPLANATION OF PLATE 3.

Western Cree Types of Algonkian Showshoes:

FIGURE 1. The usual Western Cree type with a two-piece frame pointed at both ends and well turned up in front. From the Province of Manitoba, 6 feet long and $14\frac{1}{2}$ inches wide. It has an extra cross-bar in both the heel and toe spaces and a twisted rawhide cross-string near the front. The shoes are almost symmetrical and neatly made.

Montreal Snowshoe Club, Montreal.

FIGURE 2. Western Cree from Pembina River, Alberta. A two-piece frame pointed fore and aft and well turned up in front. 54 inches long and $12\frac{1}{2}$ inches wide. The shoes are right and left with two extra rounded cross-bars in the toe-spacing. A peculiar arrangement of the slings attaching foot-netting to front cross bar.

Private Collection, Montreal.

FIGURE 3. Mackenzie River Basin. exact locality unknown. Symmetrical shoes 52 inches long by 16 inches wide. A two-piece frame spliced in front and bent into a rounded form and finished with a trailer behind. The bend in front turns sharply upward at right angles. The frame is oval in cross-section, tapers both ways from the middle and is neatly made. An interesting shoe and probably a transitional form between Western Cree and Athabaskan types. Victoria Memorial Museum, Ottawa, Canada.

FIGURE 4. Western Cree from Lake Athabasca, 56 inches long by $13\frac{1}{2}$ inches wide. The usual unsymmetrical double-pointed frame well turned up in front with extra cross-bars in heel and toe-spacings. Neatly made and ornamented with tufts of wool.

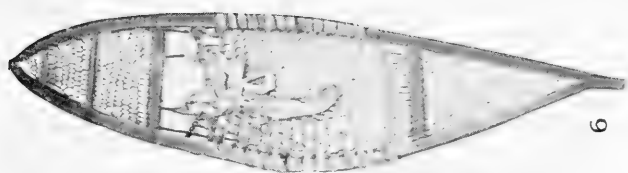
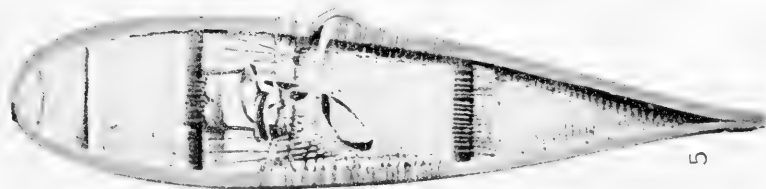
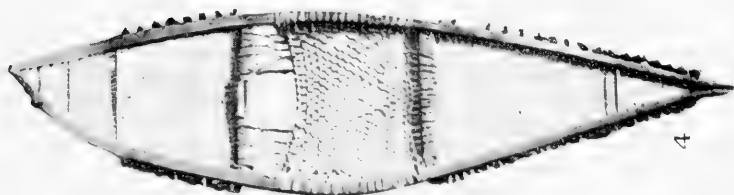
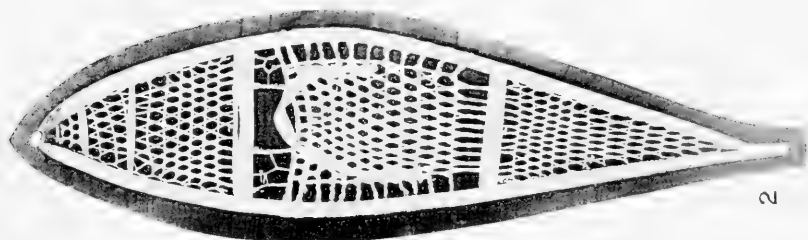
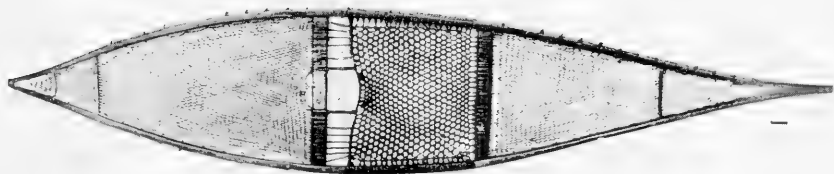
Victoria Memorial Museum, Ottawa, Canada.

FIGURE 5. A Chipewyan showshoe from Fond du Lac, $37\frac{1}{2}$ inches long and 8 inches wide. Right and left but not markedly so. The typical Western Cree form well turned up in front. The Chipewyans are Athabaskans and this is a Western Cree intrusion into this area.

Victoria Memorial Museum, Ottawa, Canada.

FIGURE 6. A Sioux Snowshoe from an unknown locality. It conforms to the Western Cree type with the double pointed two-piece frame well turned up in front. The shoes are right and left and they have two extra cross-bars in the front spacing. The length is 33 inches and the width $8\frac{1}{4}$ inches.

Chateau du Ramezay Collection, Montreal, Canada.



EXPLANATION OF PLATE 4

Algonkian Snowshoe types of Eastern Canada and bordering lands.

FIGURE 1. Ojibwa Snowshoe 45 inches long and 31 inches wide. The type used around Montreal for heavy work. A hardwood frame in one piece seen in front view, while bottom and finish in a smaller behind. The shoe is perfectly flat. As this is very rarely made, and in this particular example quite an intricate pattern is worked into the heel and heel-binding.

St. George Snowshoe Club, Montreal.

FIGURE 2. Ojibwa Snowshoe with the same general description as number 1. It is 40 inches long and 17 inches wide.

Private Collection, Montreal.

FIGURE 3. This one is 36 inches long and 14½ inches wide. Private Collection, Montreal.

FIGURE 4. An old Algonkian Snowshoe from Canada, probably one of the oldest in existence. The size is not given but it is a narrow shoe from the heel to the toe. It is flat and of the same type as the others given above. Varden Collection, United States Patent Office.

FIGURE 5. A Huron Snowshoe from Lorette, Canada. A lenticular oval shoe, 35 inches long and 16 inches wide. It is perhaps a modern type and apparently a frame made from the Algonkian (wood-bar oval and the Ojibwa type).

Victoria Memorial Museum, Ottawa, Canada.

EXPLANATION OF PLATE 4.

Algonkian Snowshoe types of Eastern Canada and bordering lands.

FIGURE 1. Ojibwa Snowshoe 45 inches long and 21 inches wide. The type used around Montreal for heavy work. A hardwood frame in one piece bent in front into a wide form and finished in a trailer behind. The shoe is perfectly flat. As a rule it is very neatly made, and in this particular example quite an intricate pattern is worked into the toe and heel-meshing.
St. George Snowshoe Club, Montreal.

FIGURE 2. Ojibwa Snowshoe with the same general description as number 1. It is 40 inches long and 17 inches wide,
Private Collection, Montreal.

FIGURE 3. This shoe is 36 inches long and $14\frac{1}{2}$ inches wide.
Private Collection, Montreal.

FIGURE 4. An old Algonkian Snowshoe from Canada, probably one of the oldest in existence. The size is not given but it is a narrower shoe than the examples given above. It is flat and of the same type as the other specimens.
Varden Collection, United States Patent Office.

FIGURE 5. A Huron Snowshoe from Lorette, Canada. A lenticular oval shoe, 35 inches long and 16 inches wide. It is perhaps a modern type and apparently a transitional form between the Montagnais two-bar oval and the Ojibwa types.
Victoria Memorial Museum, Ottawa, Canada.
All of the above Snowshoes are flat.

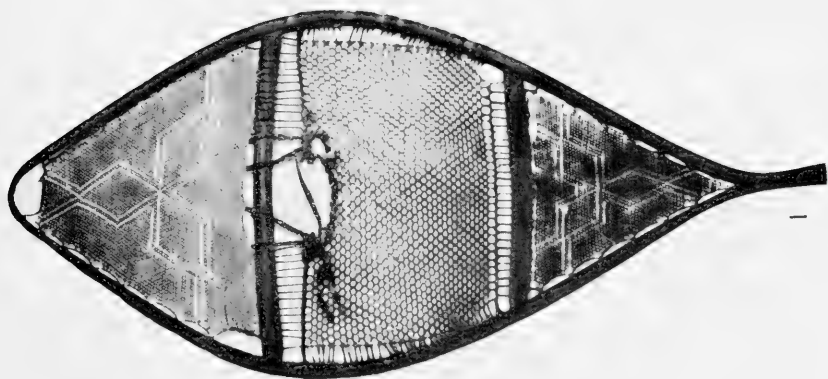
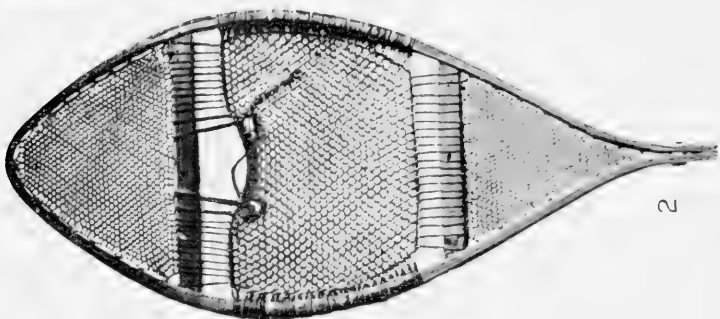
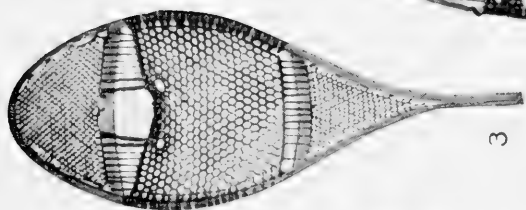
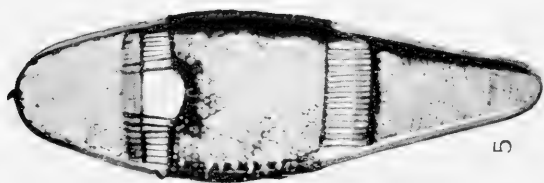
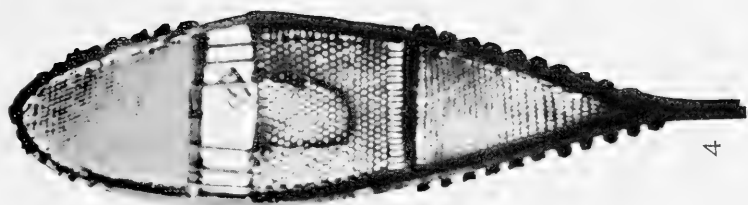


FIGURE 2. Another form of the Swallow-tail, showing the same general shape as Figure 1, but with the tail more deeply forked. Length 3 1/2 inches long and 20 inches wide. Private Collection, Montreal.

FIGURE 3. The Oval to which the tail of the Swallow-tail is attached. Length 1 1/2 inches in width. Private Collection, Montreal.

FIGURES 4 and 5 show the single-bar tail of the Swallow-tail, which is attached to the tail of the Swallow-tail. Length 1 1/2 inches in width. Private Collection, Montreal.

All of the specimens in this collection are from the same source, and are of the same size and shape.

EXPLANATION OF PLATE 5.

Snowshoes worn by Montagnais and Naskapi Indians (Algonkian) of Quebec and Labrador, Canada.

FIGURE 1. The Beaver-tail variety, 27 inches long and 26 inches wide. North Shore of Gulf of St. Lawrence.
Private Collection, Montreal.

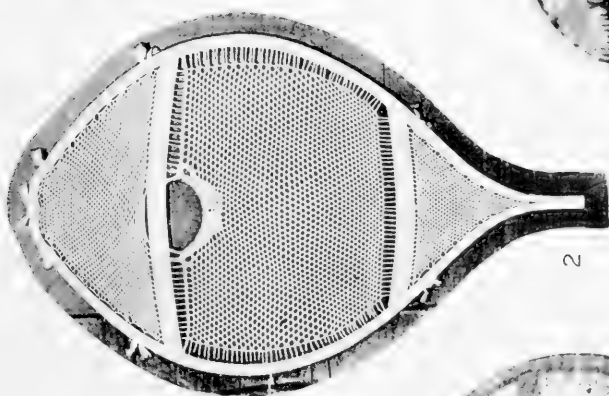
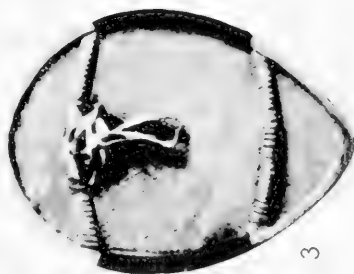
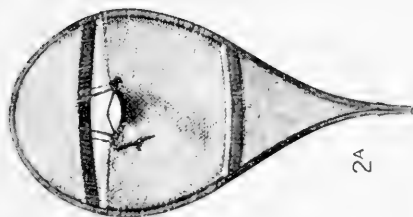
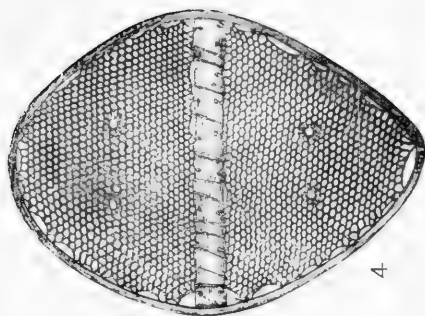
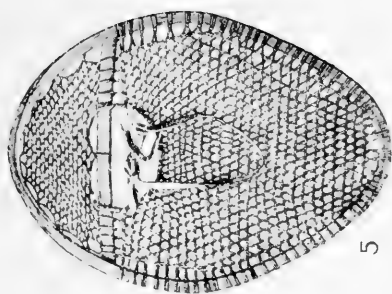
FIGURE 2. The Swallow-tail variety, 36 inches long and $12\frac{1}{2}$ inches wide. North Shore of Gulf of St. Lawrence.
Private Collection, Montreal.

FIGURE 2a. Another form of the Swallow-tail variety from the same district. It is $37\frac{1}{2}$ inches long and 20 inches wide.
Private Collection, Montreal.

FIGURE 3. The Oval two-bar variety from the same district. 24 inches long and 17 inches in width. The attachment of the foot-filling to the frame is protected by a strip of rawhide.
Victoria Memorial Museum, Ottawa, Canada.

FIGURES 4 and 5 show the single-bar variety, one with the cross-bar under the foot and the other with the bar towards the front. The dimensions are not given but they are about 18 or 20 inches in length. From the Labrador Coast. Eleventh Annual Report of The Bureau of Ethnology.

All of the Snowshoes in Plate 5 are flat, and are neatly made. In the wider varieties the cross-bars are curved.



AN ORIGIN OF PLATE 20

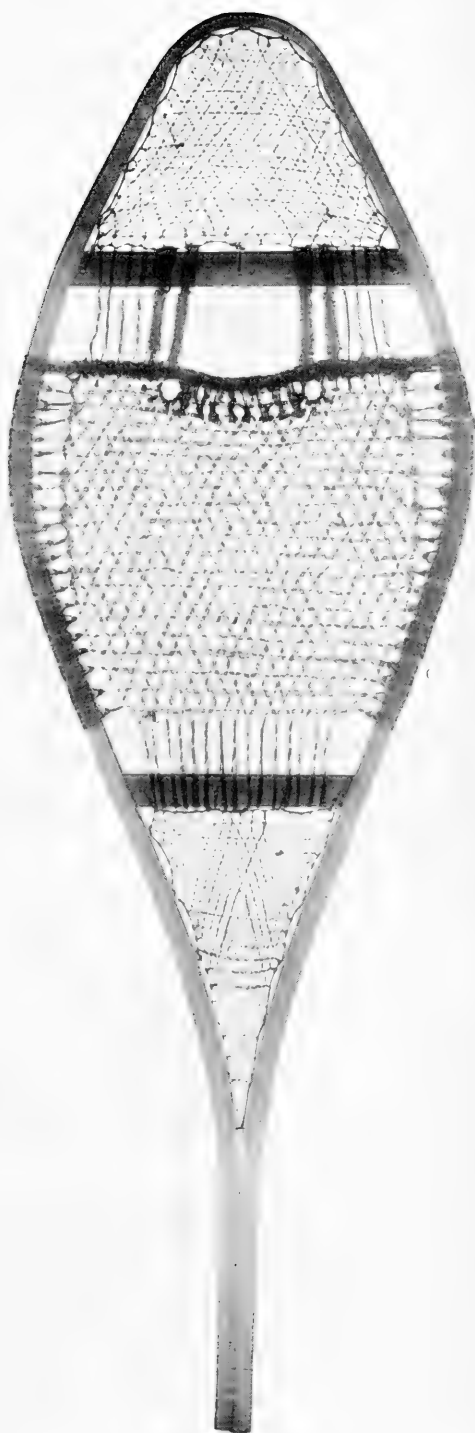
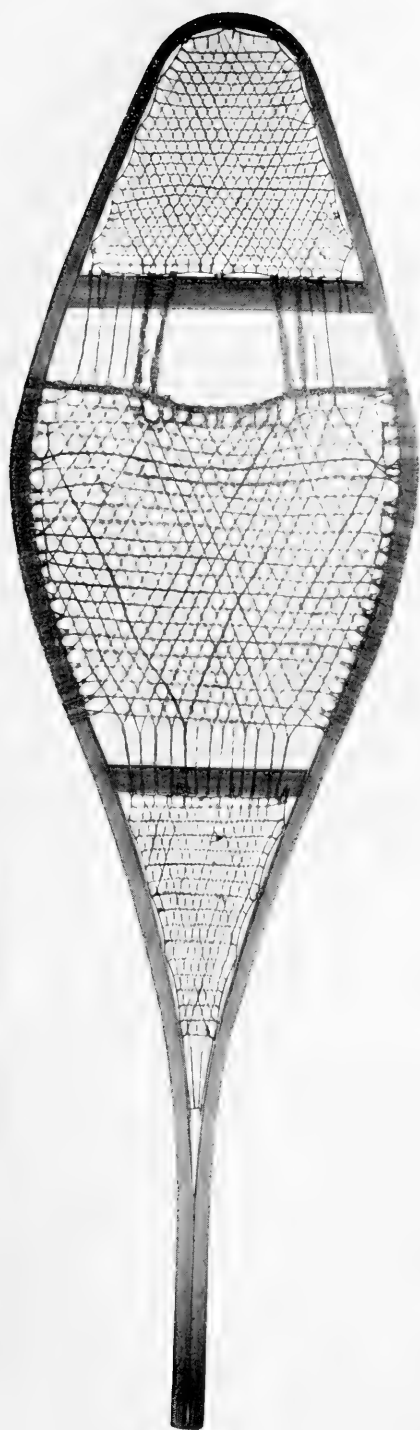
The material is made as used in the Province of () and is made of 10 inches wide and 42 inches long and is made of 10 inches long.

It is a light snowshoe suitable for sporting purposes but not for hard continuous work. The frame is usually made of Ash and is usually 10 inches long and 10 inches wide.

EXPLANATION OF PLATE 6.

The modern club snowshoe as used in the Province of Quebec is usually made in two sizes, namely 12 inches wide and 42 inches long, and 14 inches wide and 42 inches long.

It is a light snowshoe suitable for sporting purposes but not strong enough for hard continuous work. The frame is usually made of Ash and the shoe is somewhat turned up in the front.



Canadian State Trials; The King v. David McLane.

By HON. MR. JUSTICE RIDDELL.

Presented by C. C. JAMES, C.M.G., F.R.S.C.

(Read May Meeting, 1916.)

The first case of High Treason in Canada (1) if not on this continent, came on for trial at Quebec, Friday, July 7th, 1797, when David McLane (2) was given in charge to a jury of twelve at 7 o'clock in the morning, and before the Court closed at 9 o'clock in the evening he had received the dread sentence at that time pronounced on those convicted of the highest crime known to the law.

McLane, according to his own account, was born in Boston, Massachusetts, and went into business in Providence, Rhode Island, with his brother-in-law Jacob Felt. After some years of success the firm experienced losses, and in the fall of 1795 failure was imminent. They decided that Felt should take some of the stock in trade to Canada to see if the goods—dry goods they were—could not be disposed of there to advantage and the proceeds applied to satisfying the most pressing creditors.

That he lived in Providence, Rhode Island, as early as 1786 is certain from the evidence of Cushing at the trial—McLane gave different versions of the purpose of bringing the goods to the Canadian line, and it is doubtful how far his statements on any subject can be relied upon.

About this time, the French Minister to the United States, Pierre Auguste Adet (3) whose fixed idea was that France should have territories on this continent, was circulating in Lower Canada a pamphlet addressed to the French Canadians telling them that France having conquered Austria, Spain and Italy was about to subdue Great Britain and take her colonies—first of all to relieve the Canadian people from their state of slavery to Britain. This had considerable effect; the French-Canadians became uneasy and turbulent, and it was found necessary to prepare the troops for speedy action. Adet had a number of agents well supplied with money, and in some way McLane seems to have come in contact with him and to have been taken into his service.

In the summer of 1796, McLane was at Watson's Tavern, a little below the Isle Aux Noix, at what was even then known as Swanton,

Vermont, and near the Canada line. He made enquiries for Francis Chandonet, a Canadian by birth, who had left the Province in 1776 with the retreating American troops on the promise of a commission in the Continental Army, and had become a naturalised American citizen. He does not seem at that time to have met Chandonet but he did meet William Barnard of Montreal to whom he said (July 26th) that his business there was to bring about a revolution in Canada, and he invited Barnard's co-operation. Barnard did not accept, and McLane said he would be in Montreal in a few days and perhaps Barnard might think better of it. A few days afterwards he met Barnard in Montreal and again approached him with offers of a fortune if he would join in a plan of revolution. Barnard at once informed Mr. McCord, a magistrate, of these conversations, and was instructed to obtain further information. Barnard and McLane met at La Prairie early in November. Barnard, with the intention of finding out all about the scheme, suggested that some recent disturbances (4) looked like discontent on the part of the Habitants; McLane said, "this is a conquered country, there will be an army here in the spring" and again asked Barnard to assist. Barnard made no promise to do so, and at once informed the authorities. At this interview, as at others, McLane was very anxious to find out where the Seminary and the merchants kept their cash and valuable property which he said would be taken to pay the expenses of the war.

A few days before this he had come to the "American Coffee-house," a tavern in Montreal, saying he had come straight from the French minister at Philadelphia (5) and that he would return immediately to him to report, then would receive his orders, sail for France, and return in the Spring to Montreal by way of New York to take the command. All this was said to the tavern keeper, Elmer Cushing, a British subject. He had examined the Mountain, and spoke highly of its value in time of war to command the City; he also showed the tavern keeper a letter, ostensibly signed by Adet, written in English in an obscure style, to the purport that he (Adet) was interested in the family concerns of David McLane. McLane explained the obscurity by saying that it was a dangerous piece of business to go upon and that if he should be arrested and the paper found upon him it could not be used as evidence against him. He said he had himself drafted it and that Adet would have signed any other as readily.

Arms and ammunition were to be furnished by France through Adet for the attack on Montreal; and he had already many agents near the lines who had engaged to furnish him with all necessary men. A fleet was to come from France with ten to fifteen thousand land forces; while he would bring arms into the Province on rafts both

by way of Lake Champlain and the River St. Lawrence, concealed in piles of firewood.

Cushing went to Quebec and informed the Government of the scheme, without disclosing McLane's name. A week or ten days later McLane was again at the tavern at Swanton, Vt., on his way to Philadelphia (as he alleged); there he told an American, Butterfield, of his employment by Adet, his visit to Montreal to learn the sentiment of the Canadians, and that he had secured the adhesion of Barnard and one Black (whom we shall meet again). He added that he would return to Canada in April or May with a number of men from the States whom he intended to take in on rafts.

He also met Chandonet on this visit, told him the same story as that told to Butterfield, and further said that he had learnt that Chandonet was going to live at St. Regis (6) on the River St. Lawrence in New York State. He thought that Chandonet would be in a very suitable place to assist him in getting the arms and ammunition into the Province on rafts of wood in the Spring. He mentioned the stock of dry goods which his brother-in-law was going to bring to the Lines, and said that the dry goods were for the purpose of collecting a store of provisions to be ready for the insurrection in Canada. Chandonet refused to take any part in the scheme.

Nothing more is heard of McLane till the following April when he appeared at the Swanton tavern again and got into communication with Butterfield. He made enquiry for news of Canada during the winter, said he had heard that he had been discovered, and sent Butterfield to St. John's to bring Charles Frichette to him at Swanton, paying Butterfield a few dollars for expenses and promising him regular pay from the previous November.

Frichette had already met McLane the previous June at St. John's. McLane after exacting an oath of secrecy from him had tried to induce him to go to see the French Minister at Philadelphia but in vain. He then tried to get Frichette to procure "a certificate from five or six Canadians to show that there were more people who wished for a change of government." Frichette seems to have given him some hope that he would procure such a certificate—but he did not.

This time, in April 1797, "near the falls of the Missiskoui (Missiquoi) River," McLane asked for news from Canada, found that Frichette had not betrayed him and that he might safely go there. He wished Frichette to accompany him to Canada (probably to Quebec) and the two left by the South Shore Road through St. Nicholas and crossed the river about Wolf's Cove, where they landed about 2 p.m., May 10th., 1797. McLane sent the Canadian into Quebec for Mr.

Black. Frichette first represented himself to Black as having oak timber for sale, but at length asked him if he were not the Mr. Black who had been imprisoned in 1794, and, being assured that he was, said: "There is a French General within a quarter of a league from this place who wishes to concert measures with you for taking the garrison at Quebec, and you must come immediately with me to see him." Black agreed. They crossed the Plains of Abraham, went down by Wolfe's Cove and up Mr. Mabane's (7) hill about two hundred yards into a wood, where they found McLane "in a very long beard." Black had never seen McLane before, but the stranger plunged *in medias res* at once: "My plan is that of humanity. I am sorry to see a great people labouring under the tyranny of England; I propose to push the British Government from the Continent of America;" and the plan was that eight or ten men of influence, of whom Black might be one, should raise under plausible pretences as many men as possible. At the time appointed they would be joined by many from the States, armed with pikes eight feet long, headed with iron and hardened in the fire, longer than the British musket and bayonet. Laudanum would be given the garrison, a sudden attack made, and the citadel fall—it was to be hoped without loss of life, "but at the same time, for the sake of posterity, all who resist must fall." He said that he had fifteen thousand men at the Lines ready at a nod to furnish men to garrison Quebec and perhaps attack Halifax; he was the General chosen by France, young as he was, and that Adet (whom he had left on April 7th) had gone to France to bring a force to co-operate with the fifteen thousand from the States.

Black left McLane and Frichette in the wood. Frichette was to conduct McLane to Black's house in the suburbs as soon as it was dark. Black went at once and told the Honourable John Young, Member of the Executive Council; an information was sworn to, a warrant issued, and McLane arrested in bed at Black's house. A bag containing one hundred and forty dollars was found on him, most of it in silver quarter dollars. He was given a receipt in the name of "Jacob Felt," which he protested was his name and by which he had on their way to Québec requested Frichette to address him.

A fortnight thereafter, May 24th, 1797, a special Commission of Oyer and Terminer was issued under the Great Seal of Lower Canada, empowering the Justices (8) thereby assigned or any three of them to enquire, hear and determine all High Treasons and Misdemeanours of High Treasons committed within the District of Quebec; the Chief Justice of the Province, William Osgoode (9) and the Chief Justice of the King's Bench of Montreal, James Monk, being of the Quorum. The remainder of the list consisted of Dunn, Williams and

Debonne, Justices of the King's Bench at Quebec, and St. Ours, Finlay, Baby, de Longueil, Panet, McGill, Lees, Duchesnay and Young, Members of the Executive Council.

The precept (10) was signed by Chief Justice Osgoode and Dunn, Williams and Debonne, Justices of the King's Bench May 26th, returnable June 12th; making fifteen days exclusive between *teste* and return.

On Monday, June 12th., the special commission was opened at the Court House in the city of Quebec with eight commissioners present: (the Chief Justice) Osgoode, Dunn and Debonne two of the Justices of the King's Bench) and (five executive councillors)—Finlay, Baby, de Longueil, Duchesnay and Young. A grand jury was called, twenty-one gentlemen, ten with English, eleven with French names. The Chief Justice charged the grand jury at great length and with great learning, and the Court then adjourned till the 14th. On that day, the grand jury presented a Bill of Indictment against the prisoner for High Treason. The prisoner was set to the Bar and informed of the bill. The Chief Justice then told him that the Attorney General would serve him with a copy of the bill and of the jury panel, and a list of the proposed witnesses. (11). The Court added that he was entitled to Counsel if he wished for such assistance, and at his request assigned Mr. Pyke and Mr. Francklin (sometimes spelled "Franklin") to be his Counsel.

The trial was set for June 30th. The prisoner was, June 17th, served with a copy of the Indictment, jury panel and list of witnesses.

On June 30th the Court again sat, there being present the Chief Justices, Osgoode and Monk, and Mr. Justice Dunn, with others not named. The Indictment was read. It was of enormous length, a copy taking up eighteen pages of octavo size in print. The prisoner pleaded Not Guilty, and put himself for his trial on God and The Country. A *venire facias* was issued to the Sheriff returnable July 7th at seven a.m., to which time the Court adjourned.

On Friday July 7th were present Chief Justices Osgoode and Monk, Mr. Justice Dunn, and Messrs. Finlay, Baby Duchesnay and Young of the Executive Council. The Court opened at seven a.m. precisely, the prisoner was set to the Bar, the jurors called, eleven challenged by the Crown and twenty-four by the prisoner, and a jury of twelve sworn (none with a French name).

The Crown was represented by Attorney General Jonathan Sewell (13) and Mr. Caron, the defence by Mr. Pyke and Mr. Francklin. Caron "opened" (14) to the jury charging fourteen overt acts against the prisoner; the Attorney General followed with a statement of the law and of the facts which he intended to prove. He

pointed out that there were two counts, the first for "compassing the King's death," the other for "adhering to the King's enemies" both under 25 Edward III, c. 2, and that the overt acts were applicable to both counts. The address is very luminous and full, taking up some sixteen pages of the report.

Barnard, Cushing, Chandonet, Butterfield (who was admittedly an accomplice), Frichette (examined through an interpreter) and Black were called and proved the facts above set out so far as they were concerned. They were cross-examined but their stories seemed quite straightforward and they were not at all shaken. The prisoner called no witnesses. At the close of the Crown case, Mr. Pyke said the prisoner desired to be heard personally in his defence first and hoped the Court would hear both himself and his Counsel. The Chief Justice Osgoode said it was not usual for the prisoner to speak before his Counsel, but assented.

The address of McLane is respectful but rambling, he attempts no specific denial of the evidence but says his conversation was about roads, canals, questions of a mercantile nature; he explains the Adet letter by saying that one of his wife's relations had left some property in France and that he thought he would go to France and get it for the family, that he went to Philadelphia and was given this paper by the Clerk to the French Minister. But instead of going to France he came to Canada; afraid his creditors would follow him he assumed the name of his brother-in-law, Jacob Felt, with whom he had been in trade in Providence, R.I.; thought he would engage in the timber trade and also buy horses; he went to Quebec to buy horses etc., etc. "The witnesses may be honest men . . . but all are liable to mistakes and it is now evident how much they have been mistaken. They have grossly mistaken my views which were only views on trade and not at all political." He closed with a fervent invocation to God to pour into the hearts of the Judges, wisdom and knowledge, to impress on their minds and on "the minds of the jury who are now to decide upon my cause the innocence of Thy servant" and to touch the lips of his Counsel "Thy young servants" giving them eloquence and persuasive arguments "that I may live to serve and glorify Thee hereafter."

Mr. Pyke urged upon the jury that positive and indisputable evidence was necessary, not mere words and vague conversations only; but both he and Mr. Francklin wisely kept clear of the evidence. The Attorney General followed, pointing out the absurdity of the Prisoner's statements and fairly summing up the evidence.

The Charge of Chief Justice Osgoode contained a discussion of all the evidence in detail, a clear exposition of the law applicable and a compliment to all the counsel concerned. He thought the prisoner's

course in making his own defence not very judicious and left the case fairly to the jury.

The jury returned in about twenty minutes with a verdict of guilty, and that "he had no goods or chattels, lands or tenements at the time of Felony and High Treason by him committed or at any time since to their knowledge" (15).

The Attorney General at once moved for judgment of death; Counsel for the prisoner moved in arrest of judgment on two grounds (1) that the Statute under which the prisoner was convicted was a local Statute applying only to England and (2) that the Indictment did not state that the prisoner was a subject of the King. Both points were argued at length with much citation of authorities (16), but the motion was hopeless and was promptly refused.

The prisoner was again asked to say why he should not be sentenced to death; he had "nothing more to say," and the dread sentence was pronounced by Chief Justice Osgoode: "That you David McLane be taken to the place from whence you came and from thence you are to be drawn to the place of execution, where you must be hanged by the neck but not till you are dead; for you must be cut down alive and your bowels taken out and burned before your face; then your head must be severed from your body which must be divided into four parts and your head and quarters be at the King's disposal; and the Lord have mercy on your soul," (17).

On motion of the Attorney General, the Court appointed Friday, July 21st, as the day of execution, and the proceedings closed.

"This important trial commenced at seven o'clock in the morning, was concluded at nine in the evening and was attended by the most numerous audience ever assembled in Quebec."

On Friday, July 21st, McLane was taken from the common gaol, placed upon a hurdle and drawn to the *glacis* without the Garrison wall where a gallows was erected; he was accompanied by the Sheriff and Peace Officers, a military guard of fifty men and a great multitude of spectators. The procession arrived at the gallows about a quarter to ten; McLane dressed in white linen grave clothes and wearing a white cap at once rose up from the hurdle and attended by the Rev. Messrs. Mountain and Sparks engaged for several minutes in fervent prayer. He then informed the executioner that he was ready and was directed by him to mount the ladder which he did immediately, descending a step or two on the executioner's direction; he then addressed the spectators; "This place gives me pleasure, I am now going where I have long wished to be and you who see me now, must follow me in a short time, some of you perhaps in a few days; let this be a warning to you to prepare for your own death." Then he addressed the

soldiers drawn up in a hollow square around the gallows: "You with arms in your hands, you are not secure here, even with your arms, I am going where I shall be secure without them." He immediately drew the cap over his face, exclaiming; "O God, receive my soul, I long to be with my Jesus." and dropped his handkerchief as a signal for the executioner who at once turned him off. The death struggle was short; after hanging about twenty-five minutes he was cut down; a platform with a raised block on it was brought near the gallows, and a fire kindled for executing the rest of the sentence. The head was cut off and held up by the executioner with the time-honoured words "Behold the head of a traitor!", an incision was made in the abdomen and part of the bowels taken out and burned; then the four quarters were marked with a knife, nicked but not divided.

"The whole of the execution took up about two hours; and the conduct of the unfortunate sufferer was in every respect composed and becoming his situation" (18).

WILLIAM RENWICK RIDDELL.

NOTES.

(1) This was certainly the first case of trial for High Treason in Canada under British Rule. The Attorney-General, Jonathan Sewell, who was well qualified to speak, said that it was the first in America "if we except the shameful proceedings had in the year 1701 against Colonel Nicholas Bayard in the late Province of New York . . . upon a local statute." (p. 113).

Bayard, the nephew of Peter Stuyvesant, whose secretary he was, became Secretary of the Province after its conquest by the English. He was also Mayor, and became Commander-in-Chief of its Militia. On the opposition (Leisler) party obtaining the upper hand in the Colony, he "was imprisoned, kept in irons & exposed as a show and carried about in a Chair at the Pleasure and for the Diversion of a tumultuating mob." He succeeded in leaving the Colony, and on the turn of the wheel he had a triumphant return. In 1699 he was accused of complicity with Captain Kidd in his piracy, but cleared himself of the charge. In 1701-2 he was convicted of High Treason in attempting to introduce Popery, Piracy and Slavery into the Colony of New York. The death of King William III, saved him from death; he was released and restored to all his possessions by order in council by Queen Anne. The curious will find a reasonably full account of Bayard in Vol. IV of the "Documents Relating to the Colonial History of the State of New York." published in Albany, 1854. Bayard's brother Peter was the ancestor of the Bayards so well known in American politics in the eighteenth and nineteenth centuries.

(2) His name is variously spelled McLane, M'Lane, MacLane, McLean, M'Lean, McLeans—the well known Lorenzo Dow calls him McClen. I have followed the orthography of the shorthand report of the trial, "The/Trial/of/David/McLane/for/High Treason/at the/City of Quebec in the Province of Lower Canada/on/Friday/the Seventh day of July A.D. 1797:/Taken in Shorthand at the trial/Quebec/Printed by W. Vondenvelden/Law Printer to the King's Most Excellent Majesty/1797." The trial will also be found reported, 26 St. Tr. 722, but I have used the Quebec print—the report on the State Trials seems to be practically identical and was no doubt taken from it.

(3) Pierre Auguste Adet, born at Nevers, 1763, devoted himself to the study of chemistry; he invented a curious system of chemical symbols, of which those interested may see a sample in the *Encyc. Brit.* Vol. 6, p. 36. Then, turning to politics, he was sent in 1795 as Minister to the United States; he was an ardent adherent of Jefferson, whose well known Francophile (at least Anglophobe) sentiments recommended him to the Frenchman. He had an *idée fixe* that France must own some part of North America, and made up his mind to the conquest of Canada. His pamphlet is mentioned in the text: and there is no doubt that he had a number of secret agents in Canada. Some account of his activities in that regard will be found in Kingsford's *Hist. Can.*, Vol. VII, pp. 441 sqq.

4. The disturbances appear to have been due to discontent with certain legislation concerning roads, of no importance now, and, according to the charge of Chief Justice Osgoode (which, it is possible, may be taken *cum grano salis*), of little significance then.

(5) Philadelphia was the capital of the United States from 1790 till 1800.

(6) St. Regis opposite Cornwall, Ontario, in New York State.

(7) Adam Mabane, a Scotsman, educated at Edinburgh for the medical profession, came to Quebec as a Surgeon in the British Army. He was pushing and untiring in his efforts to advance himself, and obtained the confidence of successive Governors, especially Haldimand whom he almost entirely dominated. He was made a member of the Executive Council, but removed by Carleton, appointed a Judge of the Court of Common Pleas under the Quebec Act of 1774, a member of the first Legislative Council, and lastly a Judge of the Court of King's Bench. He acquired considerable property and was altogether a personage in early Quebec under the British Rule.

(8) The learning on the subject of the various kinds of Courts and their jurisdictions is almost obsolete in this Province.

The Judges of Assize formerly sat under five Commissions: (1) of Assize to try actions for the recovery of land or rights connected with land; (2) of Nisi Prius to try all civil cases ripe for trial by jury; (3) of the Peace; (4) of Oyer and Terminer to try criminal cases where the Indictment was found before themselves at that sitting, and (5) General Gaol Delivery to try every one found in the Goal not under sentence.

A Commission of Oyer and Terminer might issue also to try special cases, when it was called a Special Commission. This has been done in Ontario, e.g., in the Bidulph cases. In the Commission any one might be included, but it generally read so that it could not be executed without the presence of some one or other of named persons, who were therefore said to be "of the Quorum;" these were generally, if not always, Judges. In the present case the Chief Justices Osgoode and Monk were of the Quorum thereby securing the presence of a Judge of the highest rank; and the Commission was Special. Those who were not of the Quorum were as a rule of no importance; they were not expected to interfere any more than the ordinary country Justice of the Peace interferes with the County Judge in our General Sessions.

(9) William Osgoode born in England 1754, educated at Oxford, entered at Lincoln's Inn 1773 and called 1779. In 1791 he was appointed Chief Justice of Upper Canada, arriving in the summer of 1792. He was a member and speaker of the Legislative Council and sat in criminal Courts of Oyer and Terminer. He never sat in the Court of King's Bench; when that Court was instituted in 1794 it was vacation, and before Term came around he had left for Lower Canada, having received the appointment of Chief Justice of that Province. He had an acrimonious dispute with General Prescott who became Lieutenant Governor in 1797 and who took the

part of a large faction of the French Canadians who were dissatisfied with Osgoode. Osgoode's contention was sustained and Prescott recalled in 1800; but Osgoode had had enough of Canada and resigned. His resignation took effect May 1st, 1802, and he received a pension of £800 sterling. He returned to England and died in 1824. He was a sound lawyer and was skilled both in the common law and in equity. Osgoode Hall, Toronto, the seat of the Law Society of Upper Canada and of the Supreme Court of the Province is called after him.

James Monk was of the same family as General Monk, the restorer of the Monarchy after the Commonwealth. He was the son of James Monk who was in 1752 created a Judge of the Inferior Court of Common Pleas for the County of Halifax, Nova Scotia. He had trouble with the Governor Lawrence and set him at defiance. The elder Monk also became Solicitor General of Nova Scotia in 1760; and the son was appointed to the same office in 1774, being member for Yarmouth.

He left Nova Scotia in 1776 for Quebec and was appointed Attorney General for Quebec the same year.

In Quebec he was a party to many disputes with varying success. He was appointed Chief Justice of the King's Bench at Montreal in 1794 and presided over that Court till 1825.

Of the three Justices of the Court of King's Bench at Quebec, Jenkin Williams enjoyed the reputation of being a very sound lawyer. He was for a time Secretary of the Executive Council; was during the absence of Chief Justice Livius one of the Commissioners who executed the office of Chief Justice, and became successively Attorney General and puisne Justice of the King's Bench at Quebec.

Thomas Dunn was born in 1731 in Durham, England. Engaging in commercial life, he came to Canada very shortly after the Conquest in 1759-60 and carried on business as a merchant. So far as appears he had no legal education but he was a man of great executive ability, and was "most enlightened, able minded and impartial." A member of the Executive Council very early, he became a member of the first Legislative Council in 1775, and the same year Judge of the Court of King's Bench, Quebec. He became Administrator of the Government in 1805 and again in 1811 and acted with promptness and energy. A Seigneur, he was very popular with the French Canadian people and with no small number of the English population, but in those days it was impossible to please both factions.

Pierre Amable Debonne, a French Canadian of noble family, a descendant of Sieur DeBonne Mizelle, nephew of Marquis de la Jonquière, an early French Governor, was a member of the first House of Assembly in Lower Canada, and also a member of the Executive Council in 1794. Although a Justice of the Court of King's Bench he became the leader of the French Canadian Party in the House of Assembly, and it was due, at least in part, to his activity that the bill was introduced in Craig's administration rendering Judges incapable of sitting in the House. This failed in successive Assemblies, but at length in 1810 the House by a vote of 18 to 6 resolved that Debonne being a Judge of the Court of King's Bench could not sit or vote in the House. Debonnie was not re-elected at the general election which followed.

The Members of the Executive Council (not Judges) call for no special comment from a legal point of view, though all of them were more or less active in politics and most had a career of considerable interest to the annalist.

(10) On a Special Commission of Oyer and Terminer issuing, three or more of the Commissioners, of whom one of the Quorum must be one, issue a Precept to the Sheriff to call a Grand Jury. The time between teste and return day was fixed at fifteen days (exclusive of day of teste and return) by a Special Commission appointed to try the Rebels of 1745; the Precept in that case was signed by the three Chiefs of the

Common Law Courts (Lee, C.J.K.B., Willes, C.J.C.B., and Parker, C.B.,) and the three Senior Judges after "great deliberation and search of precedents." Foster's Crown Law, p. 1. This was followed in McLane's case.

(11) By the Act of 1708, 7 Anne, c. 21, "An Act for improving the Union of the Two Kingdoms" of England and Scotland, it was provided that the accused should be given a Copy of the Indictment and at the same time a list of the witnesses to be produced against him and of the jurors on the panel with the "names, profession and place of abode of the said witnesses and jurors ten days before the trial and in the presence of two or more credible witnesses" (Sec. 11). By the Act of (1695) 7 Wm. III c., 3, the prisoner was entitled to a copy of the indictment by paying for it, five days before trial.

(12) In criminal cases as the common law was understood, no prisoner charged with such a crime was entitled to counsel except as to matters of law arising during the trial which practice even Blackstone declares "not all of a piece with the rest of the humane treatment of prisoners by the English law;" Bk. IV, p. 355. But by the Act of (1695) 7 Wm. III, c. 3, already mentioned, it was provided, sec. 1, that one accused of high treason should be admitted to make his full defence by counsel learned in the law, not more than two in number.

(13) Jonathan Sewell was the son of Jonathan Sewell the last loyalist Attorney General of Massachusetts (the preceptor of our Chief Justice Powell). The younger Jonathan Sewell was born at Cambridge, Mass., in 1766, and was educated at the Grammar School at Bristol, England. After the Treaty of Amity between Britain and the United States, he came (in 1785) to New Brunswick and studied law. In 1789 he went with his father to Quebec and was called to the bar in that year. Appointed Solicitor General in 1793, and Attorney General and Advocate General in 1795, he became a member of the Legislative Assembly. In 1808 he was appointed Chief Justice of Quebec and President of the Executive Council, and the following year Speaker of the Legislative Council. In 1814 he was impeached for subverting the Constitution, etc., but was vindicated by the Home Authorities. Resigning his position of Chief Justice in 1838, he died the following year in Quebec.

His conduct of the McLane case was skilful and fair; he had a firm grasp on the facts, which were few, and of the points of law, which were many and somewhat intricate. The Dict. Nat. Biog. says "Sewell was an excellent Chief Justice, stern but with great command of temper;" and everything in this case suggests the accuracy of the characterization.

See Morgan's Sketches of Celebrated Canadians, pp. 146, 147, and the Dict. Nat. Biog. vol. 51, pp. 286, 287.

(14) It was (and is still in some jurisdictions) the custom for Junior Counsel to open the pleadings, i.e., read the pleadings (indictment in criminal cases) to the jury, or state their substance, with such explanation as might be required; then the Senior opened on the facts, stating what facts he intended to prove. In the McLane case Mr. Caron contented himself with stating what the prisoner was charged with, and the Attorney General detailed not only the law but also the facts, and the names of the witnesses who were expected to prove these facts.

(15) Upon attainder of High Treason i.e. not merely conviction by the jury but also judgment of death, the convict forfeited to the King all his lands without regard to conveyances, etc., since the act of treason, all rights of entry, etc., all the profits of lands for life or for years, and his personal property. The jury was, upon finding the prisoner guilty, charged to inquire what lands, etc., the convict had. In many cases (as in this) no evidence was offered and the jury found "None to our knowledge."

The Imperial Act of (1870) 33 and 34 Vic., c. 23 s. 1 wholly abolished forfeiture in case of treason, Parliament having relieved the jury of the enquiry by 7 and 8 Geo. IV, c. 28. Canada got rid of the enquiry by (1869) 32 and 33 Vic., c. 29, s. 53, and abolished forfeiture by (1892) 55 and 56 Vic., c. 29, s. 965. The following cases in our Courts are worth looking at; Eastwood v. McKenzie, 5 U.C.O.S., 708; Doe d. Gillespie v. Nixon, 5 U.C.R., 132; Doe d. Sheldon v. Ramsay, 9 U.C.R., 105.

(16) The motion for arrest of judgment was properly disposed of.

(1) It was argued that the words of the statute 25 Edward III, c. 2, confined its operation to England, as the offence was to be committed "in the Realm." No doubt Canada is not "in the Realm" (Williams v Nunn, 1 Taunt, 270; Platt's Case (1777), 1 Leach Cr. Ca. at p. 168), and the Attorney General admitted this. But the statute is simply declaratory of the Common Law of England, and the Quebec Act (1774) 14 Geo. III, c. 83, s. 11 enacted that the Criminal law of England should continue to be administered in the Province of Quebec. Moreover the first clause of the Act is not limited, and the clause referring to "aid and comfort" has the words "in the Realm or elsewhere."

The Attorney General's argument was chiefly on the ground that the statute was in affirmance of the Common Law, but the judgment of Osgoode, C. J., proceeded on the latter ground. The Chief Justice cites a number of cases. "Cardinal Pole's case was a compassing in Italy; Dr. Storey's case in the Low Countries; Crohogan's in Portugal and Ebenezer Platt's case in America." [See (1571) 1 St. Tr. 1087, 3 Dyer 298 A, 300 B; (1633) Cro. Car. 322; (1777) 1 Leach Cr. Ca. 157.]

It was held in the Court of King's Bench in Upper Canada in 1807 that an action *qui tam* for *scandalum magnatum* did not lie for words respecting a Judge of our Court of King's Bench; but the Statute of Gloucester (1378) 2 Ric. II, St. 1, c. 5 was not considered an affirmance of the common law, notwithstanding the argument of Serjt. Maynard in 2 Mod. at p. 152. "Scandalum Magnatum in Upper Canada." Journal of Am. Inst. Crim. Law and Criminology for May, 1913, Vol. 4, pp. 12-19.

(2) The second was equally baseless. While in some cases where the accused was certainly an alien, the allegation was made that he was a subject, as in R. v. De la Motte, 21 St. Tr. 678, 814, it is not to be found in R. v. Ayliffe, Tremaine's Pleas of the Crown, p. 2; R. v. Horsely, *ibid* p. 4, R. v. Hayes, *ibid*; p. 5, 2 St. Tr. 844; R. v. Lord Delamere, 6 St. Tr. App., p. 55; R. v. Hampden, St. Tr. App. p. 51; R. v. Lord Preston (1st Count), 4 St. Tr. p. 410; 12 St. Tr. 645; R. v. Rosewell, 3 St. Tr. p. 947; R. v. Cranbourne et al, 6 St. Tr. App. p. 55; R. v. Charnock, 4 St. Tr. 1377. Holt, C. J., in Cranbourne's case says that in the case of an alien from whom only local allegiance is due, "*contra naturalem Dominum suum*" should not be used (4 St. Tr. at p. 700), and this is approved in Foster's Crown Law, p. 187.

But, leaving the technicality, it is perfectly plain that while an alien enemy cannot be guilty of High Treason (of this class at least), Calvin's case, 7 Co. Rep. 1, 6 b. cf. 4 St. Tr. 1182, Forsyth Cas. Const. Law. 200, unless he accepts British protection during the war, an alien friend can. R. v. De la Motte, 21 St. Tr. 687, 814, and see the recent case of DeJager v. Attorney General Natal (1907), A.C. 326, also 3 Co. Inst., 4; 1 Hale Pl. Crown 94; Foster Crim. Law 185. During the time an alien friend is within the realm he owes local allegiance, and High Treason may be "*contra legeantiae suae debitum*," as in the case of a subject, "*contra Dominum suum*."

(17) The punishment for High Treason was, until comparatively recent years, gruesome enough. The sentence continued in the prescribed form for centuries:

(1) that you are to be drawn to the place of execution

(2) where you must be hanged by the neck but not till you are dead, for you must be cut down alive

- (3) and your bowels taken out
- (4) and burned before your face (or you being still alive)
- (5) then your head must be severed from your body
- (6) which must be divided into four parts, and
- (7) your head and quarters to be at the King's disposal.

It is probable that originally there was no interval between sentence and execution and the unhappy convict was drawn at once to the gallows; but at least as early as the sixteenth century the prisoner was ordered first to be taken to the place whence he came and thence to the place of execution. Stanford's "Les Plee's del Coron" (dated 1560) foll. 182. 182b.

(1) Even in quarters usually well informed there is occasionally to be found a misunderstanding of the meaning of "drawn" in this sentence. It is supposed to be equivalent to "eviscerated," as a market woman "draws" a chicken. It really means that the convict is to be dragged to the gallows. Originally he was dragged by the heels at the horse's tail over the rough and filthy ground, which sometimes killed the victim. Sometimes, as in the case of William Longbeard in 1196, rough stones were placed in the road to make the transit more painful.

But humanity was not wholly dead, and we find sometimes an ox-hide, sometimes a hurdle spread under the sufferer by friars or others. Mr. Justice Shaw in 1340 forbade this in a peculiarly atrocious case of a servant killing his former master.

The "common oxhide" became an institution, and it later gave way to the hurdle. From contemporary woodcuts it appears that the hurdle was of wicker, flat and oblong, about seven by four feet. The prisoner was bound in it, feet toward the horse, which was attached to the hurdle and drew it along like a stone-boat. Later the sledge came into use, although the word "hurdle" was used to denote it, and by the time of McLane every convict who was to be drawn to the gallows had a "hurdle" to ride on.

(2) While the express words of the sentence prohibited hanging until death it came to be the practice to allow death to intervene before cutting down. This was not always the case, as when Townley was executed on Kennington Common in July 1716 (See *R. v. Townley*, 1746, 18 St. Tr 829) life was found in him when he was cut down and the executioner failing to kill him by blows on the chest, immediately cut his throat.

(3) While sometimes the whole of the viscera, thoracic and abdominal, were taken out, in the course of time, in most cases only a small incision was made and a small part of the viscera was burnt.

(4) A platform was placed near the gallows on which a fire was lit and the entails burnt.

(5) "The Head of a Traitor" was always held aloft and shown to the spectators by the Executioner.

(6) While originally the body was always quartered and the parts usually sent to different parts of the Kingdom, the practice grew up of simply nicking the limbs at their junction with the trunk, which was taken as a symbolic quartering.

Sometimes an additional monstrosity was added, ementulation,—e.g. William Wallace the Scottish Patriot suffered thus:

"Primo per plateas Londoniæ ad caudas equinas tractus usque ad patibulum altissimum sibi fabricatum, quo laqueo suspensus, postea semivivus dimissus, deinde abscis genitalibus et evisceratis intestinis, ac in ignem crematis, demum absciso capite ac trunco in quatuor partes secto, caput palo super pontem Londoniæ affigitur; quadrifida vero membra ad partes Scotiæ sunt transmissa" ("Flores Hist.," ed. Luard, iii. 124).

So too in the "Popish Plot," Ireland, Pickering, Grove, Langhorn and others were sentenced to suffer in this way, while Stayley, Coleman, Fitzharris and Plunket were not. Coke sentenced John Owens, alias Collins, to this in 1615; there does not seem to be any explanation of why it was ordered in some cases and not in others wholly parallel.

Those interested will find the whole subject discussed at length in Marks' "Tyburn Tree," its History and Annals," London, Brown, Langham & Co., n.d. (not earlier than September 1908) from which much of the above has been taken.

The case of *Rex. v. Walcott* (1696) Shower 127; 1 Eng. Rep. 87, may be noted. Thomas Walcott had been convicted of High Treason (he took part in the Rye House Plot, 1683), and was executed at Tyburn. His sentence ran: "*Quod predictus Thomas Walcott ducatur ad Goalam dicti domini Regis de Newgate unde venit et ibidem super Bigam ponatur et abinde usque ad furcas de Tyburn trahatur et ibidem per Collum suspendatur et vivens ad terram prosternatur, et quod secreta membra ejus amputa(n)tur et interiora sua extra ventrem suum capiantur et in ignem ponantur et ibidem comburentur, et quod caput ejus amputetur, quodque corpus ejus in quatuor partes dividatur et illae ponantur ubi Dominus Rex eas assignare voluit.*"

Twelve years afterwards the attainder consequent upon this judgment was reversed on writ of error by the Court of King's Bench, and in 1696 this reversal was affirmed in Dom. Proc.—the sole ground being that the words "*ipso vivente*" were omitted after "*comburentur*" and no words used which would be tantamount, such as "*en son view*." To the argument that it would be impossible to burn a man's bowels when he was alive it was answered "Tradition saith that Harrison one of the Regicides did mount himself and give the Executioner a Box on the Ear after his Body was opened." The whole report is replete with learning on this horrible subject.

The Imperial Act of 1814, 54 Geo. III, cap. 146, altered the punishment to (1) drawing on a hurdle (2) hanging by the neck till dead (3) the head cut off, and (4) the body quartered. 33 and 34 Vic., cap. 23, sec. 31 substituted hanging simply. In Canada we already had made that provision (1868) 31 Vic., cap., 69 sec. 4).

(18) This is a very puzzling case, not that the evidence is weak or conflicting, for it is not, but in respect of the conclusion to be drawn as to the real facts, which the evidence rather clouds than discloses.

Much in the address of McLane at his trial and his execution would lead one to suspect that he was a religious monomaniac. His prayer during the address to the jury reminds one of some scenes at the trial of Guiteau, the assassin of President Garfield, and his "I long to be with my Jesus" is not unlike Guiteau's "I am going to the Lordy." But the religious enthusiast does not deny his act; he admits it, glories in it, justifies it by Divine command laid upon him.

McLane had none of the cunning of the insane; rather the simplemindedness of the semi-imbecile. He went almost openly to those whom he desired to seduce—after obtaining a promise not to reveal what he should say (sometimes insisting upon an oath, which any man of sense should know might be broken almost as soon as made) he divulged to several his purpose to bring about a revolution. Such disclosures are generally made by real conspirators only after long intercourse and much opportunity of judging how faithfully their secret would be kept. McLane took no such precautions, but disclosed to perfect strangers the most dangerous secrets. And yet this was not wholly without system; those selected were such as he might expect would help him.

For example, Barnard said "He mentioned some circumstances that happened to me before I came into this Province to reside, by which I knew that he had taken some pains to find me out." Cushing does not seem to have repulsed him decidedly; he concealed his name, and when they parted it was expected that McLane would send to see him in the spring a man who would be known by Cushing to be McLane's agent by his saying that he had come to talk over family matters. Chandonet had left Canada in 1776 with the American troops and become an American citizen, and had since been compelled to leave Lower Canada as an alien. Butterfield was an American citizen and did become an accomplice, as the Attorney General had to admit. Frichette was a French Canadian who did assist McLane in such a way as that he might have been himself found guilty of treason; and Black had been imprisoned two years before and might therefore be considered disaffected toward the Government.

These facts seem to show that the plan was carefully concocted by someone and that the persons to be approached had been selected. Moreover, it was proved to a demonstration that he enquired for Chandonet, sent for Frichette, and went to Quebec purposely to meet Black.

This, as well as his address to the jury, prevents us from coming to the conclusion that the talk of revolution, etc., was only talk, the bluster of a weak man who wished to make himself out a man of mystery and power. There have been instances of men in drink, or even sober, boasting of crimes they never committed. For example, in early Upper Canada a Member of Parliament, Issac Swayzie, was wont when in liquor to boast of having taken part in the kidnapping and murder of Morgan the recreant Freemason; but when arrested on the charge he repudiated all his former statements, and it is as certain as anything can be that he had nothing to do with the crime.

But McLane denied, in a half-hearted way indeed, ever making the statements attributed to him; he did not admit them and say they were mere talk and brag.

The letter alleged to be signed by Adet depends upon McLane's statements alone, but his account at the trial is wholly incredible. It seems likely that Adet did give him such a letter; and the form it took is not unusual in conspiracies.

What to my mind is the strongest evidence against any conclusion but real guilt is the money found on McLane. On his story he was bankrupt and afraid of his creditors. He does not seem to have had any private means; and yet, when arrested in Quebec, he had one hundred and forty dollars, mostly in American quarter dollars. He was travelling around nearly half a year in Lower Canada and in Vermont near the line, occasionally at least paying out money, and the source of the necessary money is not disclosed. It is fair to conclude that he was supplied with money by someone interested in the work upon which he was engaged; and no other is so likely as the enthusiast Adet, to whom nothing was of value compared with the glory of France.

It seems probable that Adet did employ the foolish McLane to make enquiries as to the temper of the French Canadian people and to tamper with their loyalty to the British Crown. He never denied the charge, so far as is known, and he was a man who would not hesitate to employ and glory in any means to attain what he thought was a laudable end. That McLane was not of strong mind was no objection; he would be the more bold; and boldness might win the day.

There is no reason to fear that in this case there was any miscarriage of justice; and a perusal of the shorthand notes of the trial will prove to the lawyer that the proceedings were conducted with the utmost fairness and decorum, and that no other verdict was possible.

Gagnon, in the second volume of his "Essai de Bibliographie Canadienne" (Montreal, 1913) at p. 185, mentions this English version of the Report of this trial and in his first volume, Quebec, 1895, at p. 318, mentions a French version as follows:

"2315. McLane, Le /procès de David McLane /pour haute trahison /devant /une cour spéciale *D'oyer /et Terminer /à Québec /le 7ème juillet 1797. /Québec: /Imprimé et à vendre chez J. Neilson /1797. 22 p. in-8.*

"Procès politique dont la sentence sera toujours considérée d'une grande cruauté. McLane, récemment arrivé des États-Unis, ne s'était pas suffisamment surveillé dans ses conversations sur les choses de la politique; il fut dénoncé comme travaillant à annexer le Canada aux États-Unis. Il fut condamné par le juge Osgood à être pendu par le col; mais non jusqu'à ce que mort s'ensuive, car vous devez être ouvert en vie, et vos entrailles arrachées et brûlées sous vos yeux, alors votre tête sera séparée de votre corps, qui doit être divisé en quatre parties, etc. Que le Seigneur ait pitié de votre âme.

"Ce pauvre McLane fut exécuté sur les glacis, suivant le programme d'Osgood, à peu près à l'endroit où se trouve aujourd'hui la nouvelle maison des Soeurs Grises, à l'extrémité Est, des rues Richelieu et d'Aiguillon, dans le haut de la Côte à Cotton."

Gagnon's note is interesting. I translate:

"A political prosecution, the sentence in which will always be considered one of great cruelty. McLane, recently come from the United States, was not sufficiently guarded in his conversation concerning political affairs. He was denounced as endeavoring to annex Canada to the United States. He was sentenced by Judge Osgood(e) 'to be hanged by the neck, but not until you are dead, for you must be cut open alive, your entrails taken out and burned before your eyes, then your head separated from your body and the body divided into four parts &c. &c. And may the Lord have mercy on your soul.'

"Poor McLane was executed on the glacis in accordance with Osgood(e)'s sentence, near the place where now stands the new building of the Grey Nuns, at the eastern extremity of Richelieu and d'Aiguillon Streets on the summit of la Côte à Cotton."

This is not a very good specimen of a literary note; the facts are misstated and the connotation is misleading:

(1) McLane—unless all the evidence was false, and even he did not contend that—plotted in the United States against British rule in Canada, and he came to Canada purposely to further the plot.

(2) His words were not simply incautious statements concerning political (or State) affairs in Canada, but direct persuasion addressed to persons thought to be disaffected toward Britain.

(3) His object was not the annexation of Canada to the United States, (which might possibly be regarded as a venial offence in an American) but to substitute a foreign power—that of France—for that of Britain, a project which should have been as abhorrent to an American as to an Englishman.

(4) He was not charged with endeavoring to annex Canada to the United States, but with his real offence.

(5) The sentence was the only sentence which the existing law of Quebec permitted in cases of treason. The Legislature of Lower Canada had not changed it in its five years of existence—and it was not changed till long after. If it was cruel, it was the cruelty of the Common Law, which no one, judge or other, had any power to alter. The punishment must needs be public, as were all executions for half a century after this date. It is one of my earliest recollections seeing from my father's house the crowds around the Cobourg jail, covering fences, trees and elevations, some

of them coming from more than 30 miles distant before daybreak, so as not to miss the spectacle of a hanging.

There was no cruelty (so far as appears) in the arrest or imprisonment of McLane. He had a fair trial, and no jury could do other than convict. The presiding Judge pronounced the only sentence known to the law and possible for him. The drawing to the gallows was a very common sight in London then and for long after; and the executioner was not cruel; he mercifully evaded the law by allowing McLane to hang until he was dead (the "drop" which breaks the neck though it had been tried was not in common use till long after this time.)

What is to be the punishment for treason will depend upon the view taken of the object of punishment, but one guilty of this crime should not complain of the most severe form of punishment. He has undertaken to originate or continue civil conflict, which strikes at the root of all authority and may be expected to bring wounds agony and death to hundreds and thousands.

The English punishment for treason was brutal, but less so than that of most nations. Torture, breaking at the wheel, dismemberment by wild horses and the like, were excluded. Of course our milder age would not permit even such horrors as were a commonplace of old; but even in her worst days England could not have endured the sight of

"Luke's iron crown and Damien's bed of steel."

I do not think that anyone whose opinion is of value will ever differentiate this case of treason from those before it or near the time, and charge great or unusual cruelty here.

Mémoires de la Société Royale du Canada

SECTION I

SÉRIE III

MARS 1917

VOL. X

Des vocables algonquins, caraïbes, etc., qui sont entrés dans la langue.

Par M. LE SÉNATEUR P. POIRIER.

(Lu à la séance de mai 1916).

Les mots sauvages qui sont entrés dans le vocabulaire des Français d'Amérique, Canadiens, Acadiens et Louisianais, sont peu nombreux. On peut même aller jusqu'à dire que la langue des aborigènes n'a exercé aucune influence sur celles des européens.

Ceci peut paraître étrange, quand on considère que la Grèce, conquise et soumise, sut imposer la sienne aux Romains victorieux, et que les Francs, maîtres de la Gaule, laissèrent leur parler tudesque de l'autre côté des Vosges, pour prendre celui des Celto-romains qu'ils avaient vaincus.

A quoi faut-il attribuer le phénomène de ces conditions renversées ? Pourquoi rencontre-t-on si peu de mots hurons et algonquins dans le parler des Canadiens et si peu de mots abénaquis et micmacs dans le parler acadien ?

L'absence presque totale de mariages entre les Européens et les Américains n'en donne pas toute l'explication.

Il faut en chercher la cause surtout dans l'infériorité politique, sociale et humaine des aborigènes, au temps des grandes découvertes et des non moins grandes usurpations. Alexandre VI avait donné, dans la limite de certaines latitudes, le territoire des infidèles d'Amérique en apanage exclusif aux Espagnols et aux Portugais, sous peine d'excommunication majeure contre tous ceux qui entreprendraient sur leurs droits. François 1^{er}, qui n'avait, comme il le dit, relevé aucune clause du testament d'Adam qui autorisât ce partage, s'était, nonobstant la bulle papale, et à l'instar d'autres princes chrétiens, rué à la curée. Aux yeux des "*conquistadores*" d'Espagne, un infidèle était quelque chose comme un animal sauvage, ou un peu moins;¹ aux yeux des

¹ Vers le même temps, un paysan français qui tuait un faucon royal était pendu; un hobereau de noblesse qui assassinait un paysan s'en tirait généralement en payant une amende de 12 sous parisis, et, le plus souvent, en ne payant rien du tout, s'il était bien à la cour.

Anglais, le détenteur d'un sol dont il convenait de le déposséder, et, aux yeux des Français, un frère à convertir au christianisme, de qui l'on commençait par prendre les domaines, sans même, comme le faisaient quelquefois les Anglais, obtenir de force et de ruse son consentement au moyen de traités "chiffons de papier."

Fait curieux et apparemment unique dans la chronique de l'évolution des langues: ni le français, ni l'anglais, n'ont de leur côté non plus, exercé d'influence, ni laissé de traces perceptibles dans le parler des autochtones soumis à leur domination. La langue des vainqueurs et celle des vaincus sont venues en contact, sans jamais déteindre l'une sur l'autre, sans jamais pratiquer d'échange, sans jamais se mêler. Les ondes ont coulé parallèlement, ou en un sens opposé, sans se confondre. Ondes troubles comme celles du Meschacébé, du côté français, parce qu'elles charriaient encore les débris des langues latine, celtique et tudesque, dont elles avaient été confusément formées; ondes limpides et toutes chargées d'étincelles de vie, du côté de l'algonquin, parce qu'elles étaient plus rapprochées de leur source divine, le Verbe qui créa la lumière.

Il est maintenant à la connaissance des linguistes que le parler algonquin, que nous affectons de mépriser, est l'un des plus merveilleux qui soient au monde. Sa puissance d'agglutination jointe à la mobilité de ses verbes, dont la conjugaison semble illimitée¹, en fait un organisme vivant qui se suffit à lui-même, grâce à sa force créatrice.

Au substantif s'ajoutent les formes du dimunitif, du dubitatif, du détérioratif, du locatif, de l'augmentatif, etc.

Le verbe huron a des flexions, des modes, des états, des mouvements, des repos, des distinctions, des nuances, insoupçonnées des langues savantes qui se parlent aujourd'hui, et inconnue aux langues classiques de l'antiquité. Le duel, par exemple, dont il ne reste plus que des fragments dans le grec, y suit tous les temps et modes du verbe; il existe même là où on ne le retrouve plus en sanscrit.

La consonne et la voyelle retrouvent leur raison d'être, la première représentant l'idée abstraite, la seconde le fait concret. De leur combinaison, comme de l'union de deux hypostases, sort un concept nouveau, procédant, et distinct en même temps, de l'un et de l'autre.

Au lieu du masculin, du féminin et du neutre, illogiquement confondus dans les langues où ces trois genres existent, c'est l'animé et l'inanimé, en abénaquis. La pensée se reflète dans le verbe, palpable, si l'on peut dire, et agissante, comme une image se meut sur un écran de vues animées. C'est, au propre comme au figuré, une langue vivante.

¹ Rand dit quelque part qu'il a trouvé jusqu'à mille modifications à la forme d'un seul verbe micmac.

Comment, par exemple, expliquer que cette langue, qui n'a pas de littérature écrite, s'élève dans les harangues de ses ambassadeurs, imparfaitement traduites, à des hauteurs que n'atteignent pas toujours les tribuns de Rome et d'Ottawa ?

C'est que le "beau langage" chez les Abénaquis et les autres tribus algonquines était, à sa manière, l'objet d'une culture peut-être égale à celle que l'on trouvait dans les écoles d'Athènes et d'Alexandrie. Il y avait des vocables propres aux diverses conditions, élevées, basses ou moyennes, de la vie. Les femmes et les enfants n'avaient pas licence de faire usage de certaines expressions nobles, réservées aux chefs et aux guerriers. Les indigènes du Canada et de l'Acadie, au temps de Champlain, professaient pour leur langue le respect qu'avaient les Hébreux pour l'Arche d'Alliance.

Or, qu'est-il resté dans le vocabulaire français de cette langue qui paraît être antérieure à l'indo-européen, dont le grec, le latin, l'allemand, le slave et de celtique, sont sorties ? Quelques mots usuels, réputés bas, la plupart ; mais rien se rapportant aux conceptions de l'âme et de l'esprit.

Essayons de dresser une liste, qui sera nécessairement incomplète, des mots sauvages de toutes tribus, qui sont entrés, non pas seulement dans le vocabulaire acadien, mais aussi dans celui des Canadiens et même des Français de France.

ABENAKIS:

Tribu de la famille des Algonquins. "Ce nom vient de *Abanki*, terre du Levant, nom que les Algonquins donnaient au pays des Canibas et des autres sauvages de l'Acadie. De là, les Français appelèrent ces Sauvages "*Abenakquois*," ce qui veut dire: ceux de la terre du Levant. Ce nom désigna, d'abord, tous les Sauvages de l'Acadie, mais plus tard, il fut plus particulièrement donné à ceux de la rivière Kénébec, parce que c'était le pays des Canibas, ancêtres des Abénakis du Canada." *La Vérité*, Québec.

Le radical semble être *wābon*, lumière, blancheur, et *āki*, pays, contrée, terre; d'où *wābon-āki*.

ACAJOU:

Bois rougeâtre employé dans l'ébénisterie. C'est le *Swietenia mahoganii* de l'Amérique du Sud. Les Acadiens disent plutôt *mahogané*, mot formé de l'anglais, *mahogany*, et tiré d'un radical sauvage.

ALGONQUIN:

Grande tribu indienne amie des Français.

D'après Hewitt le radical de ce mot serait *algoomeaking*: à l'endroit où l'on *harponne* l'anguille, le poisson.

ALPACA:

"Nom vulgaire d'un ruminant sans cornes (*auchenia paco*), qui habite l'Amérique du Sud." Littré.

ALPAGA:

"Etoffe de laine faite avec le poil de *l'alpaca*" Littré. Les Acadiens et les Canadiens appellent cette étoffe *alpaca*.

ANANAS:

Fruit délicieux, appelé *nanas* par les Péruviens. Le premier écrivain français qui en fasse mention est, je crois, André Thevenet, un moine, qui écrivait en 1555.

C'est le *pine-apple* des Anglais, le *ananassa sativa* des botanistes. Ceux que nous servons à table nous viennent de la Floride et des Antilles.

ARAGAN:

"Panier d'écorce de bouleau solidement liée, à l'usage des cuisinières." N. E. Dionne.

APICHIMON:

Mot qu'on trouve dans Rageot "Avec un apichimon de 8 Castors;" (A.D. 1691), et aussi dans Bougainville.

Equipement d'hiver consistant en peaux, raquettes, traîneau, collier de portage, mitaines, etc. D'après Jacques Viger (1810): Grabat, morceau d'étoffe etc. Mot tiré de la langue des Outaouais; inconnu dans les provinces maritimes.

ATOCA:

Canneberge, airelle à baies, *macrocarpus oxycoccus*. *Atoca* ou *attaca* est un mot incas introduit dans la langue, je crois, par Chateaubriand. Ce mot n'est pas connu en Acadie, ni le mot airelle à baie: c'est *pomme-de-pré* que nous disons. *L'atocatier* est l'arbuste qui produit *l'atoca*.

ACHIGAN:

Le *small black bass* des Anglais, le *micropterus* des naturalistes. C'est une poisson d'eau douce. Celui de l'océan, le *micropterus salmoides*, je crois, est appelé *bar* par les Acadiens.

BAYDARQUE:

Embarcation des Esquimaux, "faite de peaux de veaux marins réunis par des coutures plates, exécutés avec des nerfs de ces animaux." (Bonnefoux et Paris, *Dict.*)

Elles sont percées de trous où s'ajuste le pêcheur, ficelé lui-même à la barque, devenue ainsi insubmersible. On s'en sert pour toutes chasses et pêches, même celle de la baleine.

Le *baydarque* me paraît être un autre mot pour désigner le *kayac* des Esquimaux.

BABICHE:

"Lanière très étroite, taillée dans un cuir ordinaire, ou la peau d'anguille, et destiné à faire une couture grossière." L'Abbé H. R. Casgrain.

"Les Sauvages disent: *sisibab*, une corde; *sisibabish*, une petite corde. L'accent est sur la syllabe *bab*, et nos trappeurs ont laissé tomber les protoniques." Père R. P. Z. Lacasse, O.M.I.

Mot en usage dans le pays de Québec. L'Escarbot, dans son *Histoire de la Nouvelle-France*, parle de l'*ababich*.

BASTISCAN:

Nom d'une rivière du pays de Québec. Mot tiré de la langue algonquine.

Est devenu un juron euphémique dans la bouche des Canadiens-Français :

M'en aller? Bastiscan! On ne me déloge pas de cette façon. P. Lemay, *Picounoc le Maudit*.

BOUCANE, BOUCANER, BOUCANERIE:

Boucane: Synonyme de fumée; la *boucane* m'étouffe; faire de la *boucane* pour chasser les maringouins.

Boucaner a déplacé, en Acadie, et remplacé à toutes fins *fumer* et *enfumer*; nous disons *boucaner* de la viande; du poisson *boucané*.

L'Académie n'admet pas encore *boucane*; mais elle a *boucan*, *boucaner* et *boucanier*. De *boucaniers*, forbans dont la mer des Antilles fut longtemps infestée, les Anglais ont fait *buccanneers*.

Aux vocables reçus à l'Académie, les grands dictionnaires ajoutent *boucanage* et *boucanière*, mots inconnus en Acadie, aussi bien que *boucan*.

Furetière prétend que c'est un mot caraïbe. Ce qui porte à le croire, c'est qu'on le trouve dans Lescarbot, historiographe de Port-Royal d'Acadie, qui écrit vers 1612: "Les Brésilliens" ont

toujours sur le *boucan* (c'est une grille de bois assez haute bâtie sur quatre fourches) quelques venaison ou poisson, ou chair d'homme." Et ailleurs, parlant des Micmacs, il nous dit qu'ils mangent "du poisson boucané, c'est-à-dire rôti."

Dierreville (p. 84), qui parcourait l'Acadie vers 1708, nous apprend qu'on y fait *boucaner* le gibier pour le mieux conserver.

CACAO:

Sorte d'amande, qui forme la base du chocolat. Mot d'origine indienne.

CACAOUI, *Harelda glacialis*:

Canard sauvage, mot d'origine abénaquise. Bien connu en Acadie et dans tout le bas du fleuve Saint-Laurent.

CAÏMAN:

Crocodile de la Floride. Chateaubriand en fait mention dans son voyage d'Amérique.

CANAOUA:

"Terme dérisoire, ou de mépris, appliqué aux sauvages par les blancs. Ce mot était d'un usage très répandu, au siècle dernier. On disait aussi *canaouache*.

Les *Canaouas* vont t'écorder comme une anguille.

De Gaspé, *Anciens Canadiens*, II, 135. Sylva Clapin, *Dictionnaire Canadien-Français*.

CANISTO:

Ce mot, courant dans le parler acadien, me paraît d'origine indienne.

Le *canisto* ou *canistean* est un *soulier mou*, c'est-à-dire non tanné, fait avec le jarret de la patte de derrière de l'original, le poil en dehors. Le genou de la bête correspond au talon de l'homme.

La différence entre un *canisto* et un *soulier mou*, c'est que celui-ci n'a pas de jambièr.

CANOT:

Mot d'origine allemande, selon les uns, d'origine sauvage, selon les autres. Brachet le fait venir de *cane*, qui viendrait lui-même de l'allemand *kahn*, *bateau*. Tout est possible en étymologie. D'un autre côté, le grand chroniqueur espagnol, Pierre Martyr écrit:

"Illa in terram, suis lintribus, quas *canoas*, vocant, exuderunt." Colomb fait usage de ce mot dans la relation de ses voyages. Le canot

acadien, communément appelé *canot d'écorce*, ou canot sauvage, est un bateau léger et élégant, formé d'un squelette en menues planchettes de frêne recouvertes d'écorces de bouleau, ou *mashkoui*.

A *Canot* se rattache *canotier*, *canotage*, *cannoter*.

"Comme il (Pierre Gambie) retournait à la Caroline conduit dans un *canoa* (petit bateau tout d'une pièce) par deux Sauvages."

Lescarbot, *Hist. de la Nouvelle-France*, Vol. 1, p. 88.

"Les Armouchiquois—, Virginiens, Floridiens, et Brésiliens font une autre façon de canots (ou *canoas*).

"Car n'ayant ni haches ni couteaux, ils brûlent un grand arbre bien droit par le pié, et le font tomber, puis prennent la longueur qu'ils désirent, et se servent de feu au lieu de scie, grattant le bois brûlé avec des pierres, et pour le creusement du vaisseau, ils font encore de même."

Idem, *Tome III*, p. 75.

Cette dernière embarcation est plutôt la *pirogue*.

De *canot* vient le mot *canotée*, ce qu'un *canot* peut porter.

CACAOUI:

Aussi *kacauouic* et *Kacarlic*; *Harelda glacialis* (Leach).

Espèce de canard sauvage.

"Les chasseurs lui ont donné le nom de *Kakawi* à cause du cri qu'il fait entendre, lorsqu'il se lève." De Puyjalon.

CANAOUICHE ou CANAWISH:

Mot tiré de la langue indienne et qui dans la bouche des coureurs-de-bois canadiens signifie camarade.

CARCAJOU:

Blaireau du Labrador: *incles Labradorica*. Chateaubriand le définit une espèce de tigre ou de grand chat. On dit aussi *kinkajou*.

On en trouve une intéressante description dans l'*Histoire Naturelle* de Henri de Puyjalon.

"Ce sont dit-il, les Sauvages qui l'ont nommé Kar-ka-joo; mais ils le désignent le plus souvent sous le nom de *qua-que-sut*, 'le diable des bois.'" Cette épithète lui convient à tous égards.

CARIBOU: renne du Canada.

Il ya deux espèces de *caribou*, le *caribou* des bois, *tarandus ran-gifer* (Gray) et le *caribou* des plaines, *tarandus arctitus*; celui-ci beaucoup plus petit que l'autre. Chateaubriand emploie ce mot dans le *Genie du Christianisme*, ce qui fait qu'il a passé dans le dictionnaire de l'Académie.

CAZAGOT:

Espèce de panier, attaché au dos, dans lequel la femme montagnaise porte son enfant. Ce mot est entré dans les lettres canadiennes. Correspond à la *nagane* des Algonquins, mot en usage en Acadie et en bas de Québec.

CATAMARANE:

Bac improvisé. Le mot ne s'est pas généralisé; les Acadiens disent de préférence un *gandeleau*.

CHICHIQUE:

Corne remplie de pois, qui produit un bruit de crécelle, lorsqu'on l'agite.

Ce mot d'origine iroquoise, n'est en usage que parmi les Canadiens.

CÉZAN:

Mot apparemment d'origine sauvage—"Dessus de souliers appelés, mocassins:" j'ai taillé mon *cézan* de soulier trop petit.

Peut-être y a-t-il des rapports entre *cézan* et mogasin." James Geddes, jr.

CAYE:

"En anglais *key*. Dans certaines parties des Indes occidentales, on donne le nom de *cayes* à des bancs dont le sommet est plat, assez étendu, peu éloigné du niveau de la mer, et qui sont formés de sable mou, de vase, de coraux ou de madrepores." (*Dict. de Bonnefoux et Paris.*)

La *caye* correspond à la *basse* des eaux de l'Acadie.

CHIBEN, CHIBEQUI:

Topinambour. Ce mot semble venir de l'algonquin. Employé surtout dans la Gaspésie.

CHICHIQUEOIS:

Instrument de musique, espèce de crécelle—"Cette instrument, fait de bois, de peau desséchée ou de corne, se compose d'un manche et d'une portion creuse, remplie de petit osselets, de petits cailloux, ou de plomb à tirer." J. C. Taché.

Paraît venir de *chichigouane*, serpent à sonnettes.

COLIBRI:

Le plus petit et le plus joli des oiseaux. C'est le nom que lui donnaient les Caraïbes.

CONDOR:

Le plus grand et le plus puissant des oiseaux. Son nom nous vient des Incas.

DODICHE:

"En sauvage, *dodish* ou *todish*, désigne toute espèce de jupons pour les enfants. C'est un mot qu'on entend cent fois par jour sous la tente." Mot inconnu à l'est de Québec. Père Lacasse, O.M.I.

DORIE, DORÉ:

"Probablement d'origine indienne; nom donné dans les Indes occidentales et aux alentours de golfe du Mexique, au canot que l'on fabrique tout simplement en creusant une grosse bûche." *James Geddes, Jr.*

ESURGNIS:

C'est le *wampum*, autre mot sauvage, des Anglais. Grains de porcelaine dont les aborigènes faisaient des chapelets.

Lors chascune dicelles donna audict cappitaine ung collier d'*esurny*.

Jacques Cartier, *Bref récit* p. 44.

FOUÈNE:

Mot apparemment abénaquis en usage par les pêcheurs des rives du Saint-Laurent. Correspond à *nigog*, autre mot indien, employé universellement par les Acadiens.

GASPAREAU OU CASPAREAU:

Poisson migrateur, très semblable au hareng ordinaire. Les ichthyologistes—puisqu'il faut les appeler par leur nom—lui donnent celui de *clupea vernalis* ou de *clupea serrata*. Les Anglais les appellent *alewives* ou *allwives*, et, quelquefois, comme nous, gaspareau.

Ce poisson remonte les rivières après que le hareng, *clupea harangus*, a passé; mais il précède invariablement la *gatte*, ou alose.

Son habitat est l'Atlantique. Des *mouvées* (bancs) considérables en ont été vues, cependant, en ces dernières années, dans le lac Ontario, sans que les savants puissent s'expliquer ce phénomène.

L'*allwives* des Anglais me paraît être l'alose des Français, mal prononcé.

"Après la plie vient le *gasparot*." *Dierreville, p. 59.*

GATTE:

Ce mot, le seul en usage parmi les Acadiens pour désigner l'alose, est-il d'origine scandinave ou indienne? Jacques-Cartier, 1er *Voyage*, nous dit que *morue* dans le langage des Sauvages de la Baie-des-Chaleurs, s'appelle *Gadagoursère*.

Le radical *gada* correspond bien à *gatte*, le *d* et le *t* se permutant en français dans un grand nombre de mots.

Mais *gatte* peut aussi venir de *jatte*, en bas latin *gabata*, en passant par le picard, voire par le normand.

En dehors de l'Acadie, je ne trouve nulle part le mot *gatte* employée pour *alose*. Roberval dans son voyage au Canada, 1542, emploie le mot *alose*, dans la liste du poisson qu'il dresse (p. 94); Champlain, et Dierreville (p. 59) disent également *alose*.

Le nom scientifique du caplan est *gadus minutus*: petite *gade* ou *gatte*. Les principales espèces de la famille des *gades* sont la morue, le merlan et la barbotte ou *gade-lotte*. Etymologiquement, *gade* et *gatte* c'est tout un.

Pourquoi les savants désignent-ils sous le nom de *clupea mediocris* la gatte de la baie de Fundy, supérieure, peut-être, en saveur à toute autre *alose* connue? Le qualificatif *mediocre* pourrait tout au plus s'appliquer à la *gatte* de la Baie-des-Chaleurs et du Golfe Saint-Laurent.

GOD:

Pingouin commun, l'*alca* des savants. Origine inconnue.

GOURGANE:

Fève ordinaire. Dans la marine française, ce sont des des fèves sèches, dont il est fait une assez grande consommation.

Ce mot d'origine inconnue me semble venir de l'Amérique, où la culture de la patate, du maïs, de la fève, était connue et pratiquée aux temps des premières découvertes.

Dans la province de Québec *gourgane* se dit aussi aussi pour *bajoue fumée*.

HAMAC:

Ce vocable peut se réclamer d'une double origine. Comme terme de marine, signifiant un lit fait d'une toile tendue et suspendue, on pourrait, presque *a priori*, lui attribuer un radical basque.

Mais ce mot existait également chez les aborigènes d'Amérique, avec la signification de filet suspendu entre deux arbres et servant également de lit. Colomb, dans la relation qu'il nous a laissée de son premier voyage, rapporte qu'un "grand nombre de sauvages se rendirent à son vaisseau pour y faire échange de leton et de *hamacas*, ou filet sur lesquels ils dorment."

Le phénomène de cette coïncidence est pour le moins curieux.

HACMATAK:

Mot universellement employé par les Anglais des provinces maritimes pour désigner le *larix americana*, ou *juniper wood*.—Les Acadiens disent plutôt du *violon*.

HADEC:

Aigrefin ou égrefin, aussi aiglefin. Sorte de morue désignée dans la langue des savants par le mot *melanogranus aeglefinus*. En ancien français, *hadot* et *hadou*. Les pêcheurs d'Ecosse en ont fait *haddie* d'où le *finn* and *haddie* que l'on nous sert à déjeuner, dans les hôtels américains et canadiens. Nous avons pris le mot directement des Anglais; mais le radical pourrait bien être indien. Aux savants à éclaircir.

Une légende s'attache à ce poisson, l'un des plus excellents des eaux de l'Atlantique. Les pêcheurs disent que les mouchetures noires qu'ils portent sont l'empreinte qui lui fut imprimée par le pouce et le doigt de saint Pierre, lorsque l'apôtre tira de sa gueule la pièce de monnaie qui servit à payer le tribut. Jolie légende: mais le *hadee* ne se rencontre que dans les eaux de l'Atlantique.

Coincidence assez curieuse: *halec*, en latin, désigne un poisson salé, dont on ne connaît pas exactement la nature.

HURONS:

Tribu indienne, très puissante, autrefois. "Les Hurons habitaient au nord des lacs Érié et Ontario. Ils s'appelaient Wyandots, et ils furent surnommés Hurons à cause du bizarre aspect de leur tête tatouée et de leur chevelure. Les premiers Français qui virent ces étonnantes têtes de Sauvages s'écrièrent: "Quelles hures."

Ce qui précède est pris de la *Vérité* de Québec, n° du 10 février 1917. *Se non è vero...*

La paternité de cette trouvaille revient au Père Lallemand.

IROQUOIS:

Tribu sauvage, ennemie des Français. "La nation Iroquoise reçut des Français le nom sous lequel elle est généralement connue et que l'on fait dériver du mot "Hiro," j'ai dit, conclusion ordinaire des harangues de ses orateurs. Les Iroquois s'appelaient eux-mêmes du nom de Hottinonchiendi, qui signifie cabane achevée. Les Hollandais, leurs voisins, les appelaient Maquas, désignation qui s'est étendue même aux Hurons.

En changeant un peu ce mot, les Anglais ont formé le nom de Mohawk, qu'ils donnèrent aux Agniers."

De la *Vérité* de Québec, n° du 10 février 1917.

Ceci est croyable, sans cependant être un article de Foi.

Me prévalant de l'axiome théologique *in dubiis libertas*, j'ose émettre l'opinion que ce nom viendrait tout aussi vraisemblablement d'une locution indienne, notée en français par *Irinachoirw*, et qui signifie *un vrai serpent*.

KACAQUI:

Canard à longue queue, d'après M.C.E. Dionne. C'est le *old Squaw* des chasseurs anglais.

KAYAK:

Canot fermé, fait de peaux, dont se servent les pêcheurs et les chasseurs esquimaux.

Le canot ouvert, en usage pour les femmes, se nomme *oumiak*.

KINIKENIK:

Vocabulaire des Sauvages de l'ouest passé dans la langue, et qui signifie un mélange de tabac indigène de saule rouge (*red willow*) et de *sumach* (rhus).

MACHICOTE:

Mot pris aux Algonquins et qui signifie jupon de femme, cotillon.

MACKINAW:

Camelot, *couverte* de laine, *capot* fait avec une couverture de laine. Ainsi appelé, parce que ce vêtement venait principalement du fort Mackinaw; tout comme le nom de *cachemire* a été donné aux châles qui viennent de la ville de Cachemire, aux Indes.

Enveloppés dans nos pelisses de bison et dans nos couvertures *Mackinaw*, nous pouvions sans être incommodés, braver la fureur du vent.

Lemoine, *Chasse et Pêche*.

MASKEG:

Marais, savanne. Ce mot d'origine *crie*, correspond au mot *mocôque*, d'origine abénaquise, employé par les Acadiens. Ce terme est entré dans la langue des Anglais du Canada.

MASKOBINA OU *Masko*:

"Nom sauvage du *sorbus americana*, le sorbier." L'abbé H. R. Casgrain. Mot en usage dans le pays de Québec.

MICHIGONEN:

"Mot d'origine montagnaise, désignant une variété de persil, d'ont l'arôme est bien supérieur à celui de nos espèces domestiques."

Sylva Clapin—*Dictionnaire*.

MOHAWK: tribu iroquoise:

Il semblerait que ce nom vienne d'un mot pris au dialecte des Narragansets, *mohowauuck*, signifiant *mangeur d'êtres vivants*, quelque chose comme cannibale.

MADOUÈCE:

Porc-épic, le *histris* des naturalistes. Ce mot apparemment pris du vocabulaire micmac est d'un emploi universel parmi les Acadiens, quoique le mot porc-épic soit aussi connu.

MAHOGANÉ:

C'est le bois d'acajou *swietenia mahogany*. Ce mot nous vient de l'anglais, qui le tient des aborigènes d'Amérique.

MAÏS:

Zea mays (L.) appelé *turquet*, *blé d'Espagne*, blé de Turquie, en France, et blé-d'Inde, en Acadie. C'est le *maize*—des Anglais.

Mot d'origine haïtienne.

"Les Armouchiquois et toutes les nations plus éloignées, outre la chasse et la pêche ont du blé de *mahis* et des fèves."

Lescarbot, *tomne* III, p. 119.

MANITOU:

Esprit, divinité. On trouve plusieurs lacs et rivières, depuis les côtes de l'Atlantique jusqu'aux prairies du Manitoba, qui portent ce nom, assurément algonquin. "Les plus nerveux, parlaient de sortir et de provoquer en combat singulier le *manitou* du Saint-Maurice"—*Sulte*.

Les îles *Manitoulines*, au nord du lac Huron, les plus grandes îles en eau douce de toute la terre, signifient les îles du *Grand Esprit*. C'est sur ces îles que se déroule l'épopée indienne de Longfellow, *Hiawatha*.

MARCHOUECHE: *Procyon lotor*:

Chat sauvage, appelé, je crois, *raton* dans le *Roman de la Rose*. C'est le *raccoon* des Anglais.

Le mot *marchouèche* nous vient apparemment des Micmacs, quoiqu'il porte fortement l'empreinte du picard.

MARIE-BARON:

Mot des Antilles signifiant, tonnerre, et qui est passé dans la langue maritime.

MASHQUABINA:

Sorbier d'Amérique. Ce mot, inconnu en Acadie, est en usage en bas de Québec, principalement dans la région du Saguenay.

"Le mot *maskouabina* veut dire graine à ours. C'est le cormier, dont les orignaux mangent l'écorce, qu'ils aiment beaucoup." J. C. Taché. *Les trois Légendes*. Peut-être devrait-il s'orthographier *mashkonabinac*.

MASHKOUÏ:

Ecorce de bouleau. Ce mot sauvage est passé tout à fait dans la langue acadienne: allumer le feu avec du *maskouï*; faire un casseau de *maskouï* pour recueillir l'eau d'érable, etc. "*Maskwa*, en algonquin, signifie celui qui étreint l'ours." (Berloin, p. 195.)

MASKINONGÉ:

Gros poisson d'eau douce, se rattachant à la famille des brochets, genre des *esoces*. Son nom scientifique est, je crois, *esox nobilior*.

Les Anglais en ont fait *masquilonge*, par le changement de *l'n* en *l* et la chute de l'accent sur *l'é*.

Il y a la rivière et le lac *Maskinongé*, dans la province de Québec.

MATACHÉ:

Tacheté, marqué de taches, meurtri: il a la peau toute *matachée*. Je crois que les Acadiens tiennent ce mot des Sauvages, qui l'employaient dans un sens différent.

"Poutrincourt lui fit des présents de couteaux, hache, et *matachias*, c'est-à-dire, escharpes, carcans et brasselets faits de patenotres ou de tuyaux de verre blanc et bleu." *Lescarbot*.

Le même auteur dit ailleurs: "Il porte pendu à son col....une bourse en triangle, couverte de broderie, c'est-à-dire de *matachiaz*."

J'ai vu quelque part que le prétendu Sauvage qui avait assassiné Howe, à Beauséjour, était un Acadien, *mataché* par les soins de l'abbé Leloutre, au dire des Anglais. Ici, le mot signifie déguisé en sauvage. L'abbé Leclercq et les autres missionnaires écrivent se *matachier*.

MAXANGUA:

Nom d'un arbre des Indes occidentales, dont l'écorce sert à fabriquer des cordages. Le dictionnaire maritime de Bonnefoux et Paris l'a recueilli.

MICOCOUIILLER:—*Celtis occidentalis*.

Essence de bois très dur, précieux en ébenisterie. Ce mot dont le radical est inconnu et vrai-semblablement d'origine américaine.

MICMACS:

Indigènes appartenant à la grande famille abénaquise, et qui, sous la domination française, habitaient plus particulièrement le territoire compris aujourd'hui par le Nouveau-Brunswick, l'île du Prince-Edouard et une partie de la Gaspésie.

Quelle est l'origine de ce mot? Quand et par qui le nom de *Micmac* fut-il donné aux sauvages de l'Acadie. J'en fis la demande à M. Benjamin Sulte, une autorité en histoire du Canada, et voici ce qu'il m'a répondu:

"Par qui et à quelle occasion le nom de Micmacs fut donné aux Souriquois ou Algonquins de l'ancienne Acadie?

"Le page suivante d'une brochure portant pour titre UNE TRIBU PRIVILIGIEE: SOUVENIR DU III^e CENTENAIRE DES MICMACS et publiée en 1910 par le Rev. P. Pacifique, O.M.C., répond parfaitement à cette question: c'est-à-dire qu'elle fait du micmac!

"La tribu des Micmacs appartient à la grande famille des Algonquins, qui occupait jadis la moitié de l'Amérique du Nord. Les Abénaquis ont gardé le souvenir d'une alliance ancienne, ou confédération établie entre eux pour résister efficacement aux incursions des Iroquois. Un indien instruit de Oldtown, Maine, a consigné par écrit cette tradition des Peaux-Rouges et beaucoup d'autres choses anciennes.

"Leur pays, dit-il, fut partagé en trois immenses régions ou provinces. La première devait appartenir pour toujours au PERE des nations et à son peuple; c'était OTTAOUAKIAG, le pays des Outaouais ou 'terre des origines.' La deuxième était pour le *fil* *ainé*; elle s'appelait OUAPANAKIAG, 'pays de l'aurore,' ou pays des Abénaquis et des nombreuses tribus qui s'y rattachent. La troisième province était celle du PLUS JEUNE: MIKMAKIAG, pays des Micmacs, en leur langue *Migmagig*, 'contrée de l'amitié' ou pleine 'd'agrément,' située tout à l'est, sur les bords du Grand Lac d'eau Salée: c'était l'Extreme Orient des Algonquins. Le pacte fut scellé par une cérémonie symbolique. Le plus ancien des *Micmacs* présents fut mis dans l'état où il était au sortir du sein de sa mère et couché dans TKINAGAN ou berceau sauvage; il y fut gardé et nourri toute la journée, comme un petit enfant. A chaque réunion périodique, tous les sept ans, on répéta la même cérémonie, jusqu'à l'arrivée des blancs. On montrait par là que MICMAC ayant été choisi une fois comme le plus jeune fils, il devait toujours rester le Benjamin de la grande famille du Nord" (*Life and Traditions of the Red Man*, by Joseph Nichols, Oldtown, Maine, 1893, p. 130).

"Ces indiens ont toujours occupé la partie orientale du Canada, elmi *OSAOFG OFSFGFOANFG*, 'la pointe extrême du soleil levant,' comme ils disent.

"Ils sont aujourd'hui disséminés un peu partout en petits groupes. Le plus considérable est Restigouche, sur la baie des Chaleurs: c'est la métropole des *Micmacs*. Mais le grand Chef de toute la tribu réside au Cap Breton.

"Le nom de *MIGMAGIG* s'appliquait particulièrement à la région de la rivière Miramichi, dont le nom n'est peut-être qu'une transformation du premier. Les anciennes relations ignorent totalement le nom de Micmacs: le Père Biard et Lescarbot, comme Champlain, ne parlent que des Souriquois, un nom local ou régional. Le Père Lallemant nomme: les sauvages du Cap Breton, 'les Souriquois qui sont plus avant dans les terres (N.E.) ceux de Miscou (N.B.) ceux de Gaspé, etc.,' Le Père Leclercq nomme ses sauvages Gaspésiens, nom local également. Il est possible encore que les *Micmacs* aient voulu cacher intentionnellement leur véritable nom, que l'on trouve mentionné officiellement pour la première fois dans une liste de présents faits à la tribu, en 1693. Mais il est certain que tous ces noms locaux ne désignent qu'un seul peuple, ayant un même chef et une même langue."

Il semble hors de doute que le nom de *Micmac* donné à la tribu qui habitait originairement et habite encore le Nouveau-Brunswick, lui vienne de l'Amérique même, peut-être bien de l'Amérique du Sud, si l'on en croit Huet, cité par Ménage, qui dit dans son dictionnaire: "L'on appelle *micmac*, dans le Pérou, les colonies envoyées d'une province dans une autre. Cela s'apprend de plusieurs endroits de l'histoire des Incas de Garcilasso de la Vega. Ce mot semble avoir passé en Espagne et de là être venu jusqu'à nous."

Ceci est plutôt vague; mais le fait que le nom n'est arrivé qu'assez tard dans l'histoire lui donne de la *consistance*.¹ D'un autre côté, Littré, qu'il ne faut jamais négliger, nous dit que *micmac* vient "de l'allemand *mishmasch*, de *mishen*, mêler."

Mishmasch signifie mélange, confusion. Le mot anglais, *to mix* appartiendrait à ce radical.

Une autre autorité rattache l'un et l'autre mot au latin *miscere*, mêler.

J'ai moi-même vu le mot écrit *micmah*, dans quelque auteur du XVIIe siècle, dont je ne puis me rappeler le nom.

¹ *Consistance*, dans le parler des Acadiens, signifie, par extension, vraisemblance, apparence de vérité. Cette locution; ça *ne consiste en rien*, signifie ça n'a pas d'importance.

Il y a ici, ce me semble, confusion. Nous sommes en présence de deux vocables qui n'ont de commun qu'une similitude de sons, l'un de provenance germanique ou latine, l'autre d'origine américaine. Il est assez mal aisé, ethnologiquement il est impossible, de rattacher le nom honorable donné par les Français—assez tardivement—à cette tribu de fidèles et dévoués Sauvages, nos alliés et amis, depuis le premier jusqu'au dernier jour de la colonie française, à un radical tudesque, voire latin, dont la signification, jusque dans ses plus éloignés dérivés, est plutôt péjorative. Pour ma part je préfère à tout ce qui précède le mot sauvage *nicmack* ou *micmak*, qui signifie *allié*, paraît-il.

MICOUANNE:

Ecrit *micouenne*, par les écrivains canadiens: Ecuelle, *casseau* de *mashkoui*; grande cuillère de bois avec laquelle les Sauvages mangent la *sagamité*, et le *fricot*.

D'après le *Parler Français*, *micouenne* signifierait surtout, dans la province de Québec, "une grande cuillère en bois ou en écorce pour mettre le sucre en moule."

Ce mot se prononce plutôt *mischcouane*, en Acadie. Vient de l'algonquin *emikwan*.

MITASSE: Jambière, genouillère.

Mot d'origine iroquoise, employé par les Canadiens, mais inconnu en Acadie.

MOCCASINE OU MOCAZINE:

Soulier sauvage en peau non tannée. Les dictionnaires donnent *mocassin*; mais Chateaubriand l'épelle *mocassine*: Atala "me broda des *mocassinès* de peau de rat musqué."

"Outre ces grands bas de chausses, les nôtres (sauvages) usent de souliers qu'ils appellent *Mekezen*, lesquels ils façonnent fort proprement. Le cuir n'en est pas corroyé ni durci." *Lescarbot*.

MOCAUQUE:

Savanne. Employé en Acadie.

MOUFFETTE:

C'est le nom qu'au Labrador on donne à la "bête puante" *skunk* en anglais, le *mephitis americana* des zoologistes. Ce mot est-il bien d'origine sauvage?

MOYAC ou MOÏAC:

Canard sauvage, connu sous le nom de *eider*, et dont les plumes fournissent l'édredon. C'est l'*eider-duck* des Anglais; pour les ornithologistes, *somateria mollissima*.

Jacques Cartier les appelle *cannes*.

NAGANES:

"Les nâganes sont de jolies planchettes, munies de lacets, de cerceaux et d'une courroie de porteur, sur lesquelles on emmaillotte les enfants à la mamelle: espèces de nattes élégantes, qui sont les berceaux des petits sauvages." J. C. Taché, *L'Île-au-Massacre*.

NIGOGUE:

Harpon fait d'un dard entre deux machoires mobiles et dont on se sert pour prendre l'anguille, le jour, dans l'eau calme et, la nuit, aux flambeaux. L'anguille *vasée* se prend au harpon.

On prend aujourd'hui l'*épélan* avec de minuscules *nigogues*.

NIJAGAN:

"Voici comment on fait un *nigeagan*: on plante des pieux l'un contre l'autre, à l'embouchure des ruisseaux et des rivières où la mer monte; le poisson passe par-dessus à marée haute, pour aller chercher à s'engraisser du limon des marais: quand la mer a baissé, et que le poisson a manqué d'eau, il suit le jusan ou le reflux, et ne pouvant plus repasser par-dessus les pieux, l'eau étant trop basse, il s'y trouve arrêté, et l'on va les prendre." Dierreville. p. 58.

Dans le golfe Saint-Laurent, où la marée est beaucoup moins haute que dans la baie de Fundy, les *nijagans* se font d'autre façon.

Le mot est passé dans la langue courante des Acadiens. Le *nijagan* correspond, je crois, au *trap-net*, que les pêcheurs de la Méditerranée appellent le *thonaire*, du radical *thon*.

ONONDOTRA:

Ce vocable, d'origine algonquine, et inconnu en Acadie, se dit pour rat-musqué, dans la province de Québec. C'est le *ondatra-zibeticus* de Lesseing.

ONONTIO:

Littéralement *Montmagny*, ou *Grand'montagne*. Mot par lequel les indigènes désignaient le gouverneur.

Ce terme est inconnu du peuple, mais les poètes l'ont conservé.

ORIGINAL:

Les anciens, parmi les Acadiens, disent *orignâ*. C'est *orignac*, avec la chute du *c*, comme *Matapédiâ*, pour *Matapédiac*. Les premiers auteurs qui font mention de l'élan du Canada, écrivent également *orignac*.

Nous lisons dans Lescarbot: "Les Basques appellent un cerf ou ellan, *orignac*," et, en un autre endroit: "l'élan, lequel les sauvages appellent *aptaptou*, et nos Basques *orignac*."

On peut conclure par ce qui précède, que le mot *orignac* (original) vient du basque. Plusieurs croient, cependant, que c'est un mot d'origine indienne.

L'original est le *cervus alces* de Linnée, le *moose* (mot d'origine abénaquise) des anglais.

OUANANICHE:

Saumon d'eau douce, le *salmo salar*. Diffère du *touladi*.

OUAROUARI, (WARWARI):

Vacarme assourdissant. Ce mot paraît être une onomatopée; mais, d'un autre côté, on donne, aux Antilles, le nom de *hourwari* ou *wourwayry* à une bourrasque mêlée d'éclairs et de tonnerre.

Les Acadiens emploient ce terme presque universellement: C'est un *ouarouari* à ne pas s'entendre; l'assemblée a tourné en un véritable *ouarouari*.

OUAOUARON (wâwâron):

Grosse grenouille verte, qui, durant les nuits du printemps, remplit les méréages du bruit énorme de sa voix.

Ce pourrait bien être une onomatopée, et je serais porté à le croire, si les Iroquois n'avaient le mot *ouaron* qui signifie également une grosse grenouille.

OUTIKO:

"Géant, on monstre fabuleux, dans les légendes sauvages."

S. Clapin, *Dictionnaire*.

OURAGAN:

Tempête de vent d'une violence extrême.

C'est, aux Antilles, une cyclone d'un diamètre variant de 50 à 100 milles, avec une vélocité de 80 à 130 milles à l'heure.

On trouve ceci dans Nierr. *Histoire véritable de certains voyages périlleux*, citation de Ménage:

“Le mot *uracan* est un vocable des insulaires (Antilles) lequel signifie en leur langue les quatre vents joints ensemble et poussants l'un contre l'autre.”

Le mot est écrit *huracan* par Oviedo et *furacan* par Pierre Martyr, les deux premiers écrivains qui en font mention.

Il pourrait se trouver quelque lien de parenté entre *ouragan* et le *barogan* des Mongols, deux mots qui ont la même signification.

PAGAIE, prononcé *pagayé* ou *pagaille*, en Acadie:

Petit aviron à large pelle, manié avec les deux mains, sans qu'on l'appuie sur le plat-bord de l'embarcation et qui n'est pas retenu par un *toulet*, comme le sont les grands avirons.

Ce mot paraît venir d'un arbre de la Guyane, appelé *pagaie*, avec le bois duquel on faisait des rames et des avirons.

PATATE:

La *patate* de France n'est pas celle du Canada. Notre *patate* est ce que les Français appellent *pomme* de terre, et leur *patate* est ce que nous connaissons sous le nom anglais de *sweet potatoe*. Cette dernière, peu connue, nous vient des Antilles et de la Floride.

Pour les botanistes, la *patate* canadienne est le *solanum tuberosum*, et celle du dictionnaire de l'Académie est la *convolvulus batatas*.

PACANE:

Coudrier, noisetier; probablement le *carya olivaeformis*. Mot tiré de l'algonquin. S'emploie pour désigner la noix même.

PAPOIS:

Ecorce et feuilles broyées, que l'on fume en guise de tabac. Ce mot, d'après M. Benjamin Sulte, est tiré de la langue algonquienne.

PEKAN:

Espèce de martre; *la mustella Canadensis*. Ce mot, inconnu en Acadie, est en usage dans la province de Québec.

PEMMICAN:

Ce mot, qui n'est guère connu des Acadiens, nous vient des indigènes de l'ouest du Canada.

C'est, chez les sauvages, une préparation faite avec du maigre séché, puis battu (*mâché*) et mélangé ensuite avec des substances grasses de façon à en faire des galettes.

Les blancs en font un objet de nourriture concentrée, à l'usage des soldats en campagne, et des entrepreneurs de lointaines excursions.

PÉTUN:

Mot d'origine brésilienne et synonyme de *tabac*. Les Bas-bretons disent *butun*.

Beaucoup employé, autrefois, ce mot est aujourd'hui à peu près disparu. Il n'a jamais été en usage parmi les Français d'Amérique.

"Tesmoin m'en sera l'herbe appelée des anciens *petum*, à présent *cathérinaire*, ou *medicée*, ou *herbe à la royne*." Paré.

A formé le verbe *pétuner*, fumer, priser, ainsi que *pétuneux*, fumeur de tabac, et *pétunoir*, calumet.

"Les anciens remplirent de tabac leurs pétunoirs."

Ferland, *Histoire du Canada*.

PÉTUNIA:

Plante bien connue, de la famille des solanées. Originnaire de l'Amérique du sud.

PICHOU:

Etre laid, difforme—Mot pris de la langue algonquine, d'après B. Sulte.

On dit dans le pays de Québec: laid comme *pichoune*.

PICOUILLE:

Mot emprunté à la langue des Algonquins, d'après B. Sulte, et qui signifie, maigre décharné.

PIMBINA:

Corruption du mot *pipeybinao*. Viorne comestible; fruit du *viburnum* de Linnée; *high cranberry*, en anglais. Rivière et lac *Pimbina*, dans la province de Québec.

PIOUI:

Duvet des oiseaux. Ce mot, employé dans la province de Québec, semble inconnu des Acadiens. Tiré d'un radical sauvage.

PIROGUE:

Petite embarcation, sans voiles, faite d'un tronc d'arbre, pin ou tremble, creusé avec une herminette, une gouge et un fer rouge. Les grandes *pirogues* sont faites de deux troncs d'arbre, creusés séparément, puis ajustés et assujettis ensemble.

Ce mot est tiré de la langue caraïbe.

PTARMIGAN;

Logopus albus ou mutus. Oiseau appartenant à la famille des perdrix, très abondant au Labrador. On a essayé, sans y réussir, il me semble, à rattacher ce mot au radical celtique *tàrmachan*. Il me paraît plutôt d'origine sauvage.

QUILIOU:

Du sauvage *Kiniou*, le grand aigle royal. Mot en usage parmi les coureurs-de-bois canadiens.

QUININE:

Alcaloïde végétal extrait du *quinquina*. Mot péruvien.

QUINCAJOU, OU KINCAJOU:

"Genre de mammifères plantigrades, ayant une seule espèce, le *potos caudivolvulis*—, et qui habite l'Amérique équatoriale." *Littre*.

QUINQUINA:

S'est dit aussi *quina*. La Fontaine a dit *quin*. C'est le nom d'une feuille et d'une décoction fébrifuge, fournie par le *cinchona*. Ce mot péruvien signifie écorce par excellence.

SACAKONA:

Brouhaha, l'abbé H. R. Casgrain. Ce mot indien correspond à *ouarouari*, onomatopée indienne en usage en Acadie.

SACAQUA:

Huées, vacarme, cris. Mot algonquin, selon M. Benjamin Sulte, passé dans le parler des trifluviens canadiens.

SACHEM:

Vieux chef indien, dans Chateaubriand (*Réné*). C'est le *Sagamos* des Souriquois—Abénaquis.

SAGAMITÉ:

Bouillie indienne faite avec du blé-d'inde. Mot apparemment d'origine abénaquise; *kijagamités*: *gam*, eau et *tés*, feu.

Il y a le lac *Sagamité*, dans la province de Québec.

SAGAMOS:

Chef souriquois; *sachem*: Ce mot se trouve dans Lescarbot; J. C. Taché a écrit une légende intitulée: Le *Sagamo* du Kapshouk.

SAGON:

Ce mot qui signifie malpropre, salement habillé, c'est-à-dire "salop ou salope," en dialecte acadien, pourrait venir du micmac. En tous cas, il désigne le plus souvent une *tawaye* (sauvagesse).

SAGON:

Sale, mal vêtu. Se dit des femmes. Je trouve dans Marot, II, p. 196:

Combien que *sagon* soit un mot,

Et le nom d'un petit marmot.

Je n'ai aucune preuve que ce mot soit d'origine indienne, si ce n'est que les Acadiens l'appliquent principalement aux Sauvagesse. Il se rattache probablement à *sagoïn*, espèce particulière de singe.

SAVANNE:

Mot caraïbe, qui signifie un terrain bas où les arbres ne croissent pas. Les Américains en ont fait *Savannah*.

Pour désigner le même terrain, nous employons le mot *mocôque*, qui vient des indigènes d'Amérique également, mais de ceux de l'Acadie, les Micmacs.

SQUAW:

Sauvagesse, ou femme sauvage. Quoique employé par les romanciers ce mot n'est pas encore entré dans les lexiques français. Il fait partie du vocabulaire anglais. Etant un mot iroquois, les Acadiens ne le connaissent pas: ils emploient, comme synonyme, le mot *tawaye*, ou *tawaïe*.

TABAC:

Ce mot a été pris de la langue des naturels des Antilles. Il paraîtrait que la véritable feuille de *tabac* s'appelait *cohiba*, et que c'est l'amadou, la tondre, avec laquelle on *allumait*, qui s'appelait *tobacco*.

Il peut se faire aussi que le mot soit simplement le nom de l'île *Tabago*, aussi des Antilles.

TABAGANE:

Espèce de traîneau léger, à fond large et plat, dont le devant est relevé et recourbé. Les Sauvages et les coureurs-de-bois s'en servent pour transporter leurs effets, l'hiver, sur la neige et la glace. A la

ville et au village, les jeunes gens s'amuse à glisser, du haut en bas des côtes, en *tabagane*, et cela constitue l'un des amusements les plus en vogue, au Canada, l'hiver.

TABAGIE:

Endroit où l'on fume, aussi appelé *fumoir*. Du radical *tabac*.

TACAMAHAC:

Espèce de peuplier, le *populus balsamifera* de Linnée. C'est évidemment un nom sauvage.

TAMARAK: *Larix laricina* (Du Roi).

Epinette rouge, qu'il ne faut pas confondre avec le *picea rubra*. Les Acadiens l'appellent *violon*. Dans la construction des navires et des bâtiments, la racine sert de *coude* pour rattacher solidement les pièces ensemble.

TAMARU—GUACU:

Mot brésilien entré dans la langue française, mais inconnue au Canada.

C'est une espèce langouste très estimée.

TAPIOCA:

Mot employé par les aborigènes de l'Amérique du Sud pour désigner la racine de manioc, dont ils faisaient un article de consommation, une sorte de potage.

TATOUER:

Voici ce que l'on trouve dans Littré:—"Les Indiens de Tahiti, d'après Cook, impriment sur leur corps des taches qu'ils appellent *tattoo*. Ce mot fut francisé dans le verbe *tatouer*. Il vient du tahitien *tatau*, prononcé *tataou*, qui signifie les marques ou dessins tracés sur la peau humaine; *tatau* dérive de *ta*, qui signifie marque, dessin, empreinte.

TAWEYE OU TAOUEÏE:

Femme sauvage, sauvagesse. Par extension, femme malpropre, Nous disons aussi d'une femme mal attéfiée: elle est habillée comme une *taweye*.

A l'occasion du mot *ta-weye* (*ta* étant, disons, le préfixe et *weye* le radical), faisons, à la suite de M. A. Berloin,—auteur de la *Parole Humaine*, un Canadien-français très honorablement connu dans le monde de la philologie, une incursion de haute fantaisie sur le domaine de la linguistique, et, d'étape en étape, remontons, en survolant la tour

de Babel, jusqu'à notre première mère Eve. *Eve, weye*, c'est tout un; ce qui est la démonstration évidente que la langue parlée dans le paradis terrestre était le Micmac, à moins que ce ne fut l'anglais, qui arrive bon second avec *wife*.

Des preuves? Elles abondent. J'en ai déjà fourni une. M. Berloin va nous en trouver d'autres.

"La femme est tirée de l'homme, nous dit-il, ce qui signifie *iskwe*; c'est encore l'hébreu *ischia*. *L'iskwe* ou *ikkwe* algique se prolonge dans le grec *gunê*, le latin *uxor*, l'anglais *queen*."

En Algonquin, continue le même auteur, femme se dit *iskew*. Or *wew*, *weye*, *wife*, *Eve*, c'est le même mot; simple différence de graphie.

Il y a aussi l'allemand *weib*. J'omets à dessein *wrawe* féminin de *varo*, qui signifie homme.

En voilà plus qu'il n'en faut pour démontrer, malgré Henri IV, que rien n'a moins varié sur terre que le mot Femme, que l'on peut suivre à la piste, depuis l'Eden jusque sous la cabane de nos Micmacs.

TUPI:

Tente, parmi les Sauvages de l'ouest Canadien. Les Anglais emploient ce mot fréquemment.

TOMAHAWK:

Casse-tête, massue dont les Iroquois se servaient à la guerre.

Chateaubriand emploie ce mot dans *Atala*.

TOMATE:

Le *lycoperoicum esculentum* des botanistes. Fruit d'un beau rouge, servi, soit "nature" soit en sauce sur nos tables. Tire son nom du mexicain *tomatl*.

TOPINAMBOUR:

L'helianthus tuberosus. Tubercule comestible, dont les feuilles sont employées comme fourrage. Distillé, on en fait un alcool.

Tire son nom d'un peuple sud-américain appelé *topinambour* par les premiers découvreurs. Le *topinambour* des Antilles, zingibéracée féculifère, diffère de celui du sud de l'Amérique.

TORNADO ou TOURNADE:

Cyclone des Antilles. (Voir ouragan). Les Anglais ont pris le mot chez les indigènes; et nous le prenons des Anglais.

TOULADIS, ou *touradis*:

Mot abénaquis qui signifie une truite grise de grande dimension.

On l'appelle *togue* dans l'Etat du Maine, et *kokomeche* parmi les Montagnais.

On trouve dans la province de Québec un lac et une rivière qui portent le nom de Touladis.

WAPITI:

De Puyjalon le définit "grand cerf canadien." C'est proprement le *cervus canadensis*.

Il se recontre dans les terrains de chasse du grand nord-ouest canadien, principalement sur le coté oriental des Montagnes Rocheuses; mais il s'en va s'éteignant.

WASH ou OUASH:

Tanière, dans la province de Québec.

WAMPUM:

Chapelet fait avec des coquillages et qui, chez les indigènes, servait d'objet d'échange et de monnaie. On en faisait aussi des ceintures et des ornements. Ce mot inconnu en Acadie, est entré dans la langue anglaise.

Plusieurs romanciers français s'en sont servi.

WIGWAM:

Mot passé dans la langue française et qui signifie hutte indienne, une hutte conique. Les Acadiens n'emploient pas ce mot: ils disent plutôt une *cabane sauvage*. *Sauvage* ici, est un génitif: cabane *de* Sauvage, comme dans *hotel-Dieu*, etc.

Introduction a l'étude de l'Économie Politique.

Par M. ÉDOUARD MONTPETIT, M.S.R.C.

(Lu à la réunion de mai, 1916).

I

OBJET DE L'ÉCONOMIE POLITIQUE.

L'Économie politique est la science des richesses, c'est-à-dire de tout ce qui contribue à la satisfaction des besoins humains, sans cesse multipliés et renouvelés: une feuille de papier, une aune de toile, un morceau de pain, aussi bien qu'une pièce d'or. Ce sont là des *utilités* et des *valeurs*; il suffit. Ces richesses sont produites, réparties, consommées. Elles naissent et circulent. L'Économique a précisément pour objet de les suivre dans le voyage qu'elles accomplissent de l'usine au marché de consommation.

La production repose sur trois facteurs: la nature, le travail et le capital. La nature fournit la matière et les forces physiques; elle constitue le milieu par le jeu des influences géographiques et climatériques. Ce serait une erreur de croire qu'elle se livre gratuitement. L'homme n'en saurait guère tirer et ne lui ravirait que fort peu de chose, s'il ne faisait usage de ses bras et s'il n'avait inventé des instruments de lutte, de conquête, de fabrication. Le travail, principe intelligent et directeur d'une entreprise quelconque, joue donc un rôle essentiellement actif. Il est nécessaire. Il est un effort vers la création d'une utilité, une peine que l'homme impose à sa volonté pour atteindre, soit directement, soit indirectement, à un résultat pratique, tangible. Il est aussi à l'origine du capital qui est une réserve, une mise de côté en vue d'une production ultérieure. Dans le langage courant, capital est synonyme de richesse: il désigne la somme que l'industriel ou le commerçant a placée dans une affaire. On dira: le capital de cette banque est de seize millions de dollars ou encore: cette société a, par sa liquidation, entraîné une perte énorme de capitaux. Bref, le public ne connaît guère que le capital-espèces. L'économiste emploie ce mot dans un sens beaucoup plus large, que nous préciserons mieux en comparant le capital à l'épargne. L'épargne est aussi une mise de côté, mais inactive. Elle repose et s'accumule; elle dure, elle n'agit pas. Une dépôt confié à une banque produit quelque chose puisque la banque l'emploie à faciliter les transactions com-

merciales; mais, au point de vue de l'industrie commanditée par le capitaliste, ce dépôt est inactif. Il n'assume par le risque d'une entreprise; il recherche au contraire, contre un intérêt moindre, la sécurité du placement de tout repos. La chose est plus évidente encore s'il s'agit d'une épargne enfouie dans le bas de laine, ou autrement thésaurisée. Au contraire, le capital est une épargne agissante qui continue de féconder, d'augmenter, de multiplier l'action du travail. Il revêt diverses formes: les approvisionnements, les matières premières, les bâtiments, les machines sont du capital aussi bien que les valeurs mobilières ou que les espèces métalliques. Sans doute, si on y réfléchit, c'est toujours une somme initiale qui se transforme pour les besoins de l'industrie et qui devient l'usine avec sa puissante organisation; mais on pourrait parfaitement imaginer un capital naissant et se développant sans l'assistance de la monnaie et du crédit. Un pêcheur qui creuse un arbre pour en faire un canot, instrument de pêche, crée du capital, instrument de production.¹

Ces trois éléments, aidés par des découvertes scientifiques, unis dans une collaboration étroite, sont les agents merveilleux du progrès matériel moderne. Notre régime économique est caractérisé par une production à outrance, un industrialisme fiévreux, une concentration qui peut devenir excessive et dangereuse. D'un côté, le capital, grossi de toutes les épargnes, appareil gigantesque; de l'autre le travail syndiqué, masse formidable et houleuse. Ces deux forces, mues par des intérêts opposés, se combattent sans s'épuiser. Au sein du monde ambitieux, dont tous les efforts sont tendus par l'espoir d'une fortune rapide, et qui ne connaît plus d'autre rêve, à certains moments, que celui de l'or, se pose, âpre et inquiétant, le problème social, le problème de la misère que la richesse ambiante rend plus difficile, plus cruelle à porter.

Produire ne suffit pas: il faut écouler la marchandise, rechercher des débouchés, trouver et s'assurer des marchés, les créer à l'occasion, opérer les rentrées et liquider le capital-argent pour le faire servir à de nouvelles entreprises. Nous touchons au commerce, agent de circulation. Les négociants, hommes d'affaires, dépositaires, banquiers, agents de change, commissionnaires, répartis par tout le pays, mis en relations constantes avec l'étranger, déplacent les richesses et les distribuent. Ils servent d'intermédiaires. Le plus souvent, les marchandises rencontrent, dans leur course, les murailles douanières dont les peuples, soit prudence, soit calcul, se sont entourés de partout.

¹ Voyez comment M. Paul Leroy-Beaulieu explique la genèse du capital: *Précis d'Economie politique*, pp. 40 et suiv. Cobden disait: "Le capital, c'est du travail accumulé"; ce à quoi M. de Foville ajoute: "en vue d'une production future."

Une guerre nouvelle en résulte entre eux, celle des tarifs; mais, en revanche et par une sorte d'ironie des choses, la circulation est facilitée davantage par les moyens que l'évolution économique a perfectionnés: le crédit et ses deux instruments, qui sont la monnaie et la banque. Ces derniers mots indiquent l'importance, au point de vue pratique, des questions que cette partie de l'Économie cherche à résoudre: caractères d'une bonne monnaie, métaux précieux, stabilité de leur valeur, puissance d'achat de la monnaie, variation des prix; mécanisme du change, fermeté du crédit, substitution graduelle des valeurs fiduciaires aux valeurs métalliques; fonction économique de la banque, augmentation progressive des dépôts, émission et garantie des billets; transport des hommes, des marchandises, des titres; échange commercial à l'intérieur et à l'extérieur, élaboration d'une politique douanière qui favorise l'expansion industrielle d'un pays et l'utilisation totale de ses forces productrices modérément protégées. Voilà le vaste champ où s'exerce l'activité commerciale, où elle se révèle, à la fois compliquée et harmonieuse.

La répartition des richesses offre plus d'intérêt au sociologue. Ici se noue le lien qui unit l'Économie politique à l'Économie sociale, deux sciences que l'on ne doit pas séparer, si l'une a précisément pour objet d'élaborer les principes qui guideront l'action de l'autre. Naguère, les auteurs analysaient surtout les phénomènes de la production dont ils n'apercevaient pas encore toutes les répercussions. Il leur paraissait plus utile de déterminer avant tout les conditions qui permettent le développement de la richesse. Rien de surprenant à cela. Les économistes assistaient, étonnés et captivés, au spectacle d'un monde se renouvelant sous leurs yeux. Les événements du jour confirmaient leurs espoirs de la veille. Le génie humain, sans cesse en éveil, livré à des recherches sitôt récompensées, confiant dans la poursuite de son effort scientifique, maître de la vapeur et de l'électricité qu'il avait dérobées à la nature, pouvait faire entrevoir à l'humanité des conquêtes encore plus fécondes et toujours plus nombreuses. C'était l'âge d'or! Les choses ont vite changé. Les lois économiques, libres d'entraves, ont légitimé toutes les ambitions et fondé toutes les fortunes du siècle dernier; mais elles ont aussi, par voie de conséquence, provoqué l'inquiétude, la révolte et souvent la haine, chez ceux qu'elles déshéritaient en enrichissant le petit nombre. La réaction a été brusque et presque aussitôt violente. Les fervents du progrès économique se sont effrayés des malaises qu'il suscitait, des maux qu'il engendrait. Ayant pesé la part qui revient à chacun des collaborateurs de l'oeuvre de production, ils ont réclamé des lois, humaines celles-là, des lois de protection ouvrière, qui vinssent adoucir les effets d'une concurrence hautaine, indifférente et aveugle. Ils ont

demandé que la répartition des gains fût plus équitable. L'industriel paie l'impôt à l'État, la rente et le loyer au propriétaire, l'intérêt au capitaliste, le salaire à l'ouvrier; il garde pour lui-même les bénéfices, le profit que l'exploitation rapporte. On se rend compte immédiatement des difficultés que soulève cette distribution. En veut-on un exemple? La seule question du salaire est une des plus ardues, des plus agitées. Qu'est-ce qui en déterminera le taux? La loi ou l'initiative individuelle? Est-ce l'offre et la demande, c'est-à-dire le seul nombre des bras qui se tendent vers le patron ou celui des énergies que l'entreprise réclame? N'est-ce pas plutôt la productivité du travail accompli? Au fond, le problème est-il aussi simple que cela, et sa solution ne dépend-elle pas d'une foule de circonstances dont il faut soigneusement connaître la nature et le poids? La salaire une fois fixé dans sa quotité, est-ce tout? Quelles mesures le garantiront contre les saisies abusives, contre les risques que subissent les entreprises? Ainsi naissent d'autres questions, tout aussi complexes, qui ont trait à la population ouvrière en général, à la sécurité du travailleur, à l'hygiène des ateliers, aux assurances dites sociales, au chômage, au paupérisme. La vie économique, que nous avons vue jaillir en bourdonnant hors de l'usine et se répandre par le monde, se complète ici d'un élément de plus qui l'ennoblit singulièrement, qui la sauve: la justice.

Reste un dernier acte: la consommation des biens. Elle peut être immédiate ou différée, productive ou improductive. Les richesses disparaissent par l'usage qu'on en fait; ou bien elles demeurent et sont épargnées. Cette partie de l'Économie politique a été longtemps et nécessairement incomplète, écourtée. Pour lui donner plus de consistance, on y rattachait le budget et l'impôt, les recettes et les dépenses de l'État, l'assurance et l'épargne. Elle est aujourd'hui transformée par l'étude qu'elle comporte normalement du budget ouvrier, mise en lumière par Frédéric Le Play dans ses *Ouvriers des Deux-Mondes* et ses *Ouvriers Européens*, de la dépense et du luxe, et surtout du rôle actif que peut assumer, de notre temps, le consommateur. Jusqu'à ces dernières années, consommateurs et contribuables avaient large dos. Ils supportaient, sinon sans mauvaise humeur, au moins sans représailles, les plus lourds fardeaux. L'un et l'autre étaient taillables à merci. Ils sont la masse; et la masse, aussi longtemps qu'elle se tient dans les bornes de la légalité, est bonne pâte: elle reçoit toutes les empreintes, elle oscille au moindre mouvement et subit passivement la volonté des maîtres qu'elle s'est donnés, honteuse, dirait-on, de se ressaisir, et acceptant un sort qu'elle a obscurément conscience de mériter par son inertie même et son insouciance. Heureusement il y a, ici et là, des réveils, et nous

assistons à celui du consommateur. Le bon géant s'agite. Il se ligue et consent à lutter. Il se rend compte de sa puissance et qu'elle peut lui servir à autre chose qu'à renverser les princes. On l'a vu former des associations d'acheteurs et obtenir des grands magasins d'excellentes réformes sociales. La voilà maintenant qui s'insurge contre le prix excessif de la vie, et qui use du boycottage pour faire respecter ses droits d'honnête citoyen. Il est piqué; on le verra demain réprimer d'autres abus.

Le cycle se termine ici pour recommencer aussitôt. L'homme, en se nourrissant, consomme: il refait ses forces pour continuer le travail. La consommation du charbon dans l'industrie concourt à la production. Tout se tient. Fidèle à la méthode des auteurs français, nous avons repris à notre compte les quatre divisions classiques de l'Économie politique, uniquement parce qu'elles sont commodes pour l'exposé théorique. La réalité est beaucoup plus entremêlée. Les phénomènes économiques s'y précipitent et leur action est simultanée. L'industriel produit, vend, distribue et consomme la richesse tout à la fois. Son activité ne s'arrête pas pour se diviser. Mais, pour analyser ses initiatives diverses, cataloguer en quelque sorte ses efforts, il est nécessaire de recourir à un classement: c'est l'objet de l'enseignement et sa justification.

II

VALEUR SCIENTIFIQUE DE L'ÉCONOMIE POLITIQUE.

L'Économie politique est-elle une science?

Importante question, longuement discutée par tous les auteurs de manuels et de traités. Le préoccupation première des économistes est d'affirmer et de démontrer la valeur scientifique de leurs ouvrages. Les adversaires, et ils sont nombreux depuis les auteurs dramatiques les plus gais jusques aux plus austères essayistes, prononcent avec dédain que l'Économie est un art tout au plus, un ensemble d'observations assez disparates, sans lien entre elles, sans résistance, sans poids, souvent sans intérêt.

Les auteurs dramatiques semblent avoir un faible pour l'économiste. Le vieillard charmant, discret, malicieux, homme de tout repos et membre de l'Institut par surcroît, envahit la littérature et le roman. Pour les conteurs de fables, la sagesse s'est réfugiée sous la Coupole. Ils peignent ces savants sous des dehors patibulaires: êtres inoffensifs, indulgents, souriant avec mélancolie à leur vie qui s'achève, le cœur plein de bonté et l'esprit bourré d'une science sur

laquelle ils ne paraissent pas se leurrer. Ils ont, ainsi faits, quelque chose de l'abbé Constantin et de Sylvestre Bonnard. Tel le Garin-Miclaux, de *L'Éventail*, que des chagrins d'amour ont fait "se retirer dans l'Économie politique" et dans "le trente-cinquième fauteuil de l'Académie des Sciences morales et politiques." Écoutez-le raconter sa peine: "L'Économie politique à laquelle je me suis consacré est une science ingrate, revêche, une science vieille fille. — Alors, pourquoi l'avez-vous épousée?—Oh! pas par inclination, croyez-le bien. Plutôt par dépit."¹

Les essayistes, soit politiques soit sociologues, sont plus durs. Ils n'épousent pas. Il leur déplaît que les économistes aient l'arrogance d'énoncer des principes et de prêcher une doctrine. Ils répudient, avec violence, cette pédagogie nouvelle et gênante. Ils ne prennent pas garde pourtant que le ton de leur critique se fait volontiers autoritaire: pour combattre les prétentions d'autrui, ils étalent inconsciemment les leurs. Ils dogmatisent à leur tour, au nom d'une indépendance qui tient uniquement dans l'allure de leurs jugements.

Négligeons ces querelles.

Une science ne se constitue pas d'un coup. Elle ne sort pas, toute vêtue, du cerveau des savants. Elle plonge dans la réalité, en s'y ramifiant, comme font, dans le sol, les racines d'un arbre vigoureux. Elle est conditionnée par une série de phénomènes antérieurs. Car la science est une généralisation, une synthèse; elle est un résultat. Elle observe et pénètre les faits; elle les accumule patiemment, méthodiquement, pour les classer ensuite par catégories spécifiques. Ces groupements révèlent bientôt des caractères identiques. Ils donnent lieu à des manifestations semblables. On sent, sous leur diversité apparente, une même influence qui les nécessite: ils obéissent à un principe. Ce principe est l'objet lointain, profond, de la recherche scientifique. La science se constitue lorsque l'esprit dégage, de la succession des phénomènes, la notion exacte de loi; elle naît de cette intime collaboration du réel et de la pensée. Savoir, c'est donc connaître les lois des choses et affirmer les rapports qui existent entre elles. M. Emile Picard résume d'une phrase les caractères premiers de toute science: "Ces représentations mentales des faits servent de base à nos raisonnements, écrit-il, et nous utilisons nos concepts dans des déductions qui conduisent à des prévisions; c'est en cela que réside essentiellement leur utilité."²

¹ De Flers et Caillavet: *L'Éventail*, I. Sc. 2.

² *De la Méthode dans les Sciences*: Ch. 1er *De la Science*, chapitre rédigé par M. Emile Picard, p. 16.

L'observation est multiple. Elle est lente et difficile. Les forces de la nature, harmonieuses dans leur origine, se manifestent de façon variée et compliquent l'effort du savant à les saisir. Les sciences qui ont pour objet la société se heurtent à un élément plus complexe encore, plus déconcertant : la volonté humaine ; elles doivent faire état de la mentalité, de la psychologie, des tendances de l'individu. Cela explique comment les sciences sont lentes à se former et pourquoi une longue pratique précède ordinairement la théorie.

Il en a été ainsi de l'Économie politique. Cette science n'a trouvé sa pleine formule qu'au XVIII^e siècle. Certes, bien avant cette époque les hommes ont profité du capital, utilisé le travail, organisé l'industrie, exploité l'ensemble des ressources naturelles. La monnaie est d'un usage fort ancien. La banque a fonctionné dès qu'on en a compris les avantages. Les artisans du Moyen Age et les entrepreneurs des temps modernes n'avaient pas attendu le traité de Montchrétien ni les théories des premiers économistes pour produire et progresser ; l'agriculture faisait vivre l'humanité de ses produits et alimentait l'industrie de ses matières premières longtemps avant que le docteur Quesnay ait publié, en 1756 et 1757, dans la *Grande Encyclopédie*, ses deux articles sur les fermiers et les grains. Les hommes, comme l'avoue dans Molière Monsieur Jourdain parlant, lui, de la prose, faisaient de l'économie politique sans le savoir. L'art a précédé la théorie.

Bien avant le XVIII^e siècle également des auteurs ont traité des questions économiques. Le terme *économie* est d'origine grecque : Xénophon¹ l'employa le premier pour désigner l'économie domestique. Platon, dans sa *République*, Aristote dans sa *Politique*, ont laissé des définitions singulièrement justes de la division du travail et de la valeur. "Ne croirait-on pas, en lisant ces lignes si simples et si précises, écrit M. A. Blanqui à propos de Platon, parcourir l'un de nos meilleurs traités d'Économie politique ?"² Les questions monétaires et les questions commerciales ont aussi fait l'objet, durant les temps modernes, d'une foule d'études et de monographies très curieuses où des clairvoyances inattendues voisinent à côté d'erreurs grossières et courantes. Mais l'ensemble de ces travaux épars, sans suite, ne constituait pas une science et le *Traité de l'Économie politique* que nous mentionnions plus haut, publié par Antoine de Montchrétien, Sieur de Wateville, en 1615, n'apportait guère qu'un titre plus général groupant la série des recherches empiriques poursuivies jusque-là par ces savants isolés.

¹ Xénophon : *Oeuvres complètes*, vol. 1, pp. 411 et suiv.

² Blanqui : *Histoire de l'Economie politique*. Tome I, p. 55.

Ces derniers écrivains, préoccupés des intérêts immédiats, manquaient d'ampleur et se bornaient trop volontiers. Ils ne cherchaient pas la raison profonde des choses. Le cercle de leurs études en était rétréci. Ils n'allaient pas au delà, jusqu'à la philosophie du monde économique. Ils ne percevaient pas, sous les phénomènes qu'ils analysaient souvent avec une attention minutieuse, l'action sûre et féconde des principes.

Or, dans la seconde moitié du XVIII^e siècle, il se forma, en France, une première école d'économistes dont les travaux devaient contribuer puissamment et définitivement à l'élaboration d'une doctrine scientifique. On les appelait les Physiocrates, du titre d'un ouvrage de Dupont dit de Nemours: *Physiocratie ou Constitution naturelle du Gouvernement le plus avantageux au genre humain*.

Le plus célèbre parmi ces savants fut le docteur François Quesnay, médecin de Louis XV. Il était né en 1694. Venu à Paris pour apprendre son art, il devint vite célèbre et fut le protégé de la Pompadour. Curieux et d'esprit cultivé, il s'adonna aux questions économiques et publia, outre les deux importants articles que nous savons, un ouvrage plutôt obscur, difficile et compliqué, le *Tableau économique*. Pour se distraire, le roi en composa une partie pour l'imprimerie, sans s'arrêter à ces formules revêches qui passèrent, ignorées, sous ses yeux. Le livre eut quelque retentissement et fut accueilli, avec un enthousiasme légèrement outré, par les amis de l'auteur. Mirabeau le père en fit cet éloge pompeux: "Depuis le commencement du monde, il y a eu trois découvertes qui ont donné aux sociétés politiques leur principale solidité. La première est l'invention de l'écriture qui seule donne au genre humain la faculté de transmettre sans altération ses lois, ses caractères, ses annales et ses découvertes. La seconde est l'invention de la monnaie, ce bien commun qui unit toutes les nations civilisées. La troisième, qui est le résultat des deux autres, mais qui les complète, est le *Tableau économique*, la grande découverte qui fait la gloire de notre siècle et dont la postérité recueillera les fruits."¹

Autour du docteur Quesnay s'étaient groupés Vincent de Gournay, le marquis de Mirabeau, Lemercier de la Rivière, Dupont de Nemours, l'abbé Baudeau et, plus tard, Turgot, moins ardent et plus pratique. Ces savants ont été les véritables précurseurs de la science économique. Leur oeuvre, longtemps et injustement négligée, est aujourd'hui répandue, commentée. Leur pensée originale exerça une influence inspiratrice sur l'évolution des idées.²

¹ Hector Denis: *Histoire des Doctrines économiques et socialistes*, Tome I, p. 82. On trouvera l'Analyse du *Tableau économique* dans le petit ouvrage de M. Yves Guyot, *Quesnay et la Physiocratie*.

² Georges Wenlérse: *Le Mouvement physiocratique en France* (1910).

Physiocratie veut dire gouvernement de la nature. Il existe, croyaient les économistes, des lois qui dominent les sociétés, les dirigent, les gouvernent. Les hommes y sont soumis et doivent les respecter, car elles conditionnent l'ordre social. Vainement chercherait-on à se prévaloir contre elles. Forces *naturelles*, leur triomphe immédiat ou lointain est assuré, leur action est décisive et souveraine.

Qu'est-ce à dire, sinon qu'il faut avant tout veiller au libre jeu de ces influences nécessaires? Vincent de Gournay avait ramassé en une formule brève la pensée de l'École: *Laissez faire, laissez passer*. Laissez les hommes libres. Laissez-les obéir aux impulsions profondes de la nature. Abstenez-vous de les conduire dans des sentiers que vous avez tracés contre leur gré. La liberté est la condition première de toute société: le bonheur des peuples est à ce prix.

Les Physiocrates ne donnaient pas dans le romantisme naturiste et négligeaient l'attrait des contes philosophiques. Ils ne prêchaient pas le retour à l'état sauvage, cher à Jean-Jacques et célébré à l'envi par les voyageurs qui avaient approché, hors des atteintes néfastes de la civilisation, quelque tribu primitive et candide. Ils faisaient état des efforts accomplis et voyaient le progrès dans l'avenir. Mais ils ne se préoccupaient pas autrement de définir les lois naturelles. Elles existent, pensaient-ils; leur influence est certaine puisqu'elle se révèle au sein des sociétés; mais elles ne se démontrent pas. L'esprit les connaît sans effort: elles s'imposent. "Le droit naturel des hommes écrit le docteur Quesnay, diffère du droit légitime ou du droit décerné par les lois humaines, en ce qu'il est reconnu *avec évidence* par les lumières de la raison et que par cette évidence *seule* il est obligatoire indépendamment de toute contrainte."¹ Par où cette théorie perdait toute rigueur scientifique et se dérobaît à sa base même. Elle n'en était pas moins fertile en conséquences. L'observation, mise sur la voie, allait se préciser davantage et lui trouver une expression plus rigoureuse, plus conforme à la réalité des choses.

En 1776, quelques années après la publication du *Tableau Économique*, Adam Smith, philosophe écossais, écrivait son livre célèbre, *Recherches sur la Nature et les Causes de la Richesse des Nations*. Il avait fréquenté les physiocrates et connaissait leurs idées suffisamment pour les partager ou les combattre. Il fut longtemps considéré comme le père de l'Économie politique. Il a droit à ce titre. Sa méthode est plus précise, plus exacte que celle de ses prédécesseurs. Son ouvrage révèle un esprit pénétrant, attentif et personnel. Il tient compte des faits qu'il étudie de très près. Chef de l'école dite anglaise, son influence a été extrême. Elle s'est prolongée et subsiste

¹Quesnay: *Le Droit naturel*, ch. II, p. 45.

toujours. Nos compatriotes anglais citent volontiers la *Richesse des Nations*. Cet économiste d'une époque reculée alimente encore nos querelles de ses arguments à peine renouvelés. M. Adolphe Wagner a marqué la place qu'Adam Smith occupe dans l'histoire des doctrines économiques: "A la vérité, la doctrine de Smith a été elle-même le produit d'un travail philosophique et économique antérieur; elle a subi l'influence de l'atmosphère intellectuelle du moment où elle s'est développée et où elle a reçu sa formule définitive. C'est chez certains individus que se concentre comme en un foyer, que reçoit son expression nette et scientifique, tout ce qui fermente dans la pensée de milliers d'individus sans arriver à se formuler. Adam Smith a été ce foyer: c'est lui qui a donné à la nouvelle doctrine économique la forme qui seule lui a permis d'exercer une influence durable. C'est là encore une gloire, un mérite impérissable qui lui reviennent et qu'aucun critique impartial ne saurait lui refuser."¹

Adam Smith ne partageait pas tout à fait l'opinion des Physiocrates sur l'ordre préétabli et spontané. Pour lui, la source des activités économiques réside dans l'homme même, qui poursuit toujours et partout son intérêt personnel. Ce mobile explique tout. La division du travail, l'échange, l'invention de la monnaie, le jeu du crédit, les agglomérations de l'épargne, ont une même et unique origine: l'intérêt personnel bien compris, guide de l'homme vers le progrès.

Smith est partisan convaincu de la liberté. La contrainte générerait l'essor économique d'un peuple. L'homme doit être absolument maître de rechercher sa propre voie et de profiter des énergies qu'il porte en lui-même. Chacun, travaillant pour soi, ajoute au bien commun. Les intérêts individuels, loin de s'opposer et de se détruire, s'harmonisent naturellement. "Tout homme, écrit-il, *tant qu'il n'enfreint pas les lois de la justice*, demeure en pleine liberté de suivre la route que lui montre son intérêt."²

Smith n'avait donc pas recours à l'expédient ultime et commode de l'évidence. Il démontrait, s'appuyant sur l'observation, ce qu'il croyait être le principe actif et premier du monde producteur. Il analysait successivement, de façon lumineuse, les phénomènes économiques, les reliait entre eux, cherchant sous ces manifestations dissimilables la révélation d'une force persistante, d'une même énergie créatrice. Il s'efforçait à trouver une formule scientifique que Jean-Baptiste Say devait reprendre et dégager définitivement.³

¹ Adolphe Wagner: "*Les fondements de l'Economie politique*, tome I, p. 6.

² *Recherches*, livre IV.

³ On consultera avec fruit, sur ces questions, l'ouvrage de MM. Gide et Rist: *Histoire des Doctrines économiques*, Paris, Giard et Brière, 1909.

Jean-Baptiste Say vulgarisa l'Économie politique. Ayant, durant un court séjour en Angleterre, pris connaissance de la langue anglaise, il lut dans le texte l'oeuvre d'Adam Smith. Elle l'intéressa vivement. Pénétré des idées du maître, il publie, en 1803, un ouvrage considérable, dont le titre et le sous-titre renferment une définition et une division de l'Économie que la plupart des auteurs classiques ont depuis maintenues: *Traité d'Économie politique, ou simple Exposition de la manière dont se forment, se distribuent et se consomment les richesses*.

Il veut constituer une science indépendante, libre, analogue aux autres sciences, logée dans le domaine transcendant de la théorie pure et impassible.¹ Il n'a cure de la critique et ne se préoccupe pas de savoir si ces écrits rencontrent l'approbation des hommes. Il enseigne *ce qui est*, avec la superbe du savant. Lorsque l'Empereur vient le prier de modifier suivant ses vues quelques-unes de ses opinions, il a ce courage de ne pas céder sa pensée contre des honneurs.

Jean-Baptiste Say a parlé le premier des lois économiques, dans la seconde édition de son traité, parue en 1814. Il s'emploie à les définir clairement, à les formuler, à en découvrir quelques-unes. Il en caractérise ainsi la rigidité: "Ces principes ne sont pas l'ouvrage des hommes. Ils dérivent de la nature des choses; on ne les établit pas, on les trouve; ils gouvernent les législateurs et les princes, et jamais on ne les viole impunément."² Voilà, vigoureusement exprimée, la pensée dominante du libéralisme économique. De nos jours, M. Paul Leroy-Beaulieu n'écrit pas autrement.³

Nous sommes au terme de notre recherche. Aux écrits incomplets rudimentaires, empiriques, des premiers économistes a succédé le

¹ "Nos rapports avec nos semblables sont si nombreux et si compliqués, écrivait-il, que l'on ne peut les considérer tous à la fois et dans un seul ouvrage. Il faudrait que ce fût tout ensemble un traité de politique raisonnée, de droit public, de morale individuelle et publique, de droit international en même temps que d'économie politique. Ce n'est pas en agglomérant les sciences qu'on les perfectionne. Elles ont toutes des points de contact, il est vrai, et les phénomènes que découvrent les unes exercent une influence sur ceux que découvrent les autres, mais, en marquant les points de contact, il faut distinguer les sujets de nos études. "Cité par H. Beaudrilart, *J.-B. Say*, p. XXIII.

² Voir Gide et Rist, *op. cit.* pp. 127 et suiv. J-B Say écrit encore: "Depuis que l'économie politique est devenue la simple exposition des lois qui président à l'économie des sociétés, les véritables hommes d'État ont compris que son étude ne pouvait leur être indifférente. On a été obligé de consulter cette science pour prévoir les suites d'une opération, comme on consulte les lois de la dynamique et de l'hydraulique lorsqu'on veut construire avec succès un pont ou une écluse." *Traité, Discours préliminaire*.

³ Rapprocher la Préface de son *Traité de la Science des Finances*, où il s'exprime de façon aussi tranchée.

langage scientifique des auteurs contemporains. Nous avons suivi le travail de l'esprit s'exerçant sur la succession des faits pour en déduire l'énoncé de règles communes qui serviront de guides. Nous n'avons pas épuisé la question. Il reste à connaître la valeur en certitude de ces principes économiques et si ces lois sont nécessaires, inflexibles, inviolables.

L'assurance des économistes est-elle justifiée? Possèdent-ils la vérité et doit-on accorder à leurs écrits une foi inébranlable? Les principes qu'ils énoncent sont-ils en tout temps identiques à eux-mêmes? Produisent-ils toujours les mêmes conséquences? Sont-ils continus, rigoureux? Que signifient les interminables querelles des Écoles? Qu'est-ce qu'une science ainsi combattue, partagée, apparemment contradictoire?

À dire vrai, des économistes de renom nient explicitement l'existence de principes économiques universels, causes déterminantes et premières des activités productrices. "De loi suprême unique de l'action des forces économiques, il n'y en a pas et il ne peut pas y en avoir, écrit Gustav Schmoller. Le résultat général des causes économiques d'une époque et d'un peuple est toujours pour l'esprit quelque chose d'individuel, que nous expliquons par le caractère du peuple, par l'histoire, en nous aidant de vérités générales économiques, sociales et politiques, mais que nous sommes loin de pouvoir ramener *dans tous ses éléments* à ses causes propres. En ce qui touche le développement général des rapports économiques humains, nous n'avons guère plus que des *explications tâtonnantes, des principes hypothétiques*, des considérations téléologiques."¹ Voilà qui a le mérite d'être catégorique sinon absolument clair. On peut expliquer, avec quelque sûreté d'appréciation, un point, un stade de l'histoire économique des peuples; on ne saurait définir, ni même dévoiler, la cause lointaine, originelle, de l'ensemble "des rapports économiques humains." Elle nous échappe. Elle n'existe pas; elle ne peut pas exister scientifiquement.

Nous pourrions opposer à ce témoignage le langage convaincu, ferme, ardent, de certains économistes français et que nous connaissons déjà par Jean-Baptiste Say. Retenons la pensée de M. C. Colson, membre de l'Institut, libéral modéré, qui joint à son titre de professeur d'Économie politique celui d'Ingénieur en chef des Ponts et Chaussées. Quelle est l'opinion de ce savant, dont l'esprit s'est formé au contact des sciences exactes? Tout en reconnaissant "qu'il y a quelque chose de fondé dans l'accusation d'incertitude portée contre l'Économie politique," il ajoute: cette science "conduit à des résultats certains qui, sans avoir le caractère de lois immuables, subsisteront tant que

¹ Gustav Schmoller: *Principes d'Économie politique*, Tome I, p. 264.

les dispositions primordiales de la masse du genre humain resteront ce qu'elles sont auhourd'hui."¹

Il ne faut donc pas demander outre mesure à l'Économie politique. Elle n'est pas une science mathématique, absolue, sans conteste possible, encore que certains principes économiques puissent être confirmés par des opérations numériques. Elle est une science sociale, par conséquent une science de l'homme. Son objet, c'est l'homme livré à ses activités; ce sont les rapports constants que fait naître entre les individus l'oeuvre de production et de répartition des utilités.

Elle a son domaine propre, ses méthodes, ses procédés. Elle constate les phénomènes réels, précis, caractérisés. Elle les compare et les apprécie. Elle observe, elle définit, elle affirme, elle conclut. Elle s'assimile la réalité mouvante, flexible, fuyante: le flot humain. Elle l'arrête un instant et reconnaît, sous ses ondulations, une force profonde qui l'agite et le mène. Ne peut-elle pas être vraie, restant dans ces limites, et, ses recherches demeurant impersonnelles, ne peut-elle pas atteindre, traduire cette réalité, c'est-à-dire être scientifique? Certes oui. "Si nous constatons, écrit très justement Paul Bourget, que toutes les périodes de prospérité pour les peuples ont impliqué certaines conditions, et toutes les périodes de décadence certaines autres, nous serons scientifiques en concluant que, très probablement, la pratique des unes améliorera un pays que la pratique des autres détériorera davantage. Nous serons scientifiques encore en inscrivant dans nos constitutions ces lois de santé, en proscrivant ces lois de destruction."²

Les économistes ne procèdent pas autrement. Par des constatations méthodiques et répétées, et par la réflexion, ils ont acquis des *certitudes essentielles, indéniables*, sur l'organisation du travail, la genèse et l'accroissement du capital, le mécanisme et les instruments de l'échange, la distribution et la consommation des valeurs. Ces éléments ont rendu possible de prévoir l'avenir avec quelque sûreté: les principes économiques ont ainsi maintes fois reçu la confirmation et subi l'épreuve du temps. Un exemple suffira. Les crises com-

¹ C. Colson: *Cours d'Economie politique*, professé à l'Ecole nationale des Ponts et Chaussées, Tome I, pp. 52 et suiv. Voir également, du même auteur, un article intitulé: *La valeur scientifique et pratique de l'Economie politique* (*Revue des Sciences politiques*, 15 février 1916).

² Paul Bourget: Préface des *Limites de la Biologie* du docteur Grasset. Cette étude, vivement intéressante, a été insérée dans la troisième série des *Etudes et Portraits*, sous ce titre: *De la vraie Méthode scientifique*. Ce sont là des idées formulées à plusieurs reprises par l'auteur du *Sens de la Mort*: voyez le discours qu'il prononça à l'Académie française en réponse au discours de réception de M. Emile Boutroux, séance du 24 janvier 1914.

merciales ont été étudiées, de notre époque, dans leurs origines, leur évolution, leurs répercussions, avec une remarquable et patiente exactitude. Quelle différence entre les explications fantaisistes d'un Stanley Jevons et les résultats affirmatifs obtenus par un Clément Juglar et un Jules Siegfried. Nous savons que les crises sont périodiques, qu'elles sont l'aboutissant d'une période de prospérité où la folie des spéculations provoque, accompagne, maintient un moment la hausse exagérée des prix. Des signes évidents révèlent l'approche du cataclysme. Ils ne sont pas trompeurs et l'oeil exercé les discerne clairement. Longtemps avant la crise américaine de 1907, M. Paul Leroy-Beaulieu avait prévu et presque raconté à l'avance le formidable écroulement des valeurs surexcitées.¹

Il reste un point à éclaircir, le dernier. S'il existe vraiment des lois, ou simplement des tendances économiques, les gouvernements n'ont que faire d'en gêner l'action et le système s'impose de la liberté absolue, préconisée par Adam Smith et par l'École classique. D'ailleurs, Jean-Baptiste Say nous a prévenu que les forces économiques dominent les peuples et gouvernent les rois et qu'on ne les contrarie pas sans qu'il en coûte.

Cela est juste, en principe.

La concurrence libre et l'initiative individuelle ont puissamment contribué au développement progressif du monde économique moderne. L'industrie, le commerce, le crédit, ont profité du régime de la liberté. Dans un pays neuf surtout, les énergies ont à lutter contre tant d'éléments divers qu'il serait périlleux d'ajouter encore aux difficultés par une réglementation trop hâtive, asservissante de l'effort humain.

Il est également vrai que certaines lois économiques sont immuables. En vain l'autorité cherche à les contourner, elles renaissent infailliblement, affranchies tôt ou tard dans leurs conséquences. Les lois *monétaires* offrent le type de cette rigidité. Instrument des échanges, la monnaie est une mesure des valeurs. On ne peut en modifier les caractères essentiels ni en altérer la nature. Les rois l'ont entrepris inutilement et les pouvoirs modernes ont subi le contre-coup ruineux de tentatives semblables.

Cependant la liberté a des limites. Afin de sauvegarder l'industrie et de ne pas arrêter son expansion, des écrivains, que n'émeut pas le malaise social, conseillent à l'État de s'abstenir. Optimistes à la manière des premiers économistes, ils condamnent la législation sociale au nom du progrès menacé. Cette conception ne manque pas de grandeur, mais la recherche incessante de l'intérêt personnel peut conduire aux pires abus et à de terribles réactions. La lutte n'est pas égale que soutiennent, au sein de la liberté, les hommes acharnés à la

¹ Voir *L'Economiste français*, 1906, 1907.

poursuite de la richesse. La force libérée triomphe plus facilement encore. Les faibles, les dépourvus, les moins favorisés, subiront la défaite, pour un temps. Au nom des mêmes principes qui auront provoqué leur perte, ils réclameront un jour le droit à l'existence, le droit au bonheur, et la satisfaction de leurs instincts individuels.¹

L'intervention de l'État est une nécessité sociale. La collectivité ne saurait se désintéresser du bien-être des individus, ni permettre, fût-ce sous le très noble prétexte de respecter les libertés économiques, que l'injustice ou la souffrance menacent le plus grand nombre. Faudrait-il, par exemple, laisser la concurrence continuer son oeuvre de rabais parmi les ouvrières à domicile et renoncer au seul moyen pratique de les protéger—la détermination d'un salaire minimum—pour le seul souci de ne pas troubler le jeu des intérêts ?

Il y a, au dessus des lois économiques, des lois d'humanité. Nous croyons que les enseignements de l'Économie politique ne sont pas inutiles et que les gouvernements en doivent tenir compte. Ils sont précieux. Il ne faut pas tomber dans l'excès contraire et les négliger de parti-pris. Mais nous ne saurions admettre que l'idée de justice soit bannie systématiquement d'un monde livré uniquement à des préoccupations matérielles. Ne résistons-nous pas, chaque jour, aux forces physiques ? Le progrès, c'est la main-mise de l'homme sur les forces naturelles captées, assagies, maîtrisées. Si le progrès social l'exige pourquoi en serait-il autrement des forces économiques ? "Je respecte infiniment, disait Ferdinand Brunetière, les lois de l'Économie politique; seulement je ne les crois pas de fer ni d'airain, et quand on me dirait qu'elles le sont, quand on me le prouverait, je protesterais encore et je dirais qu'au XXe siècle, dans une société civilisée, deux choses, retenez-le bien, sont inadmissibles, l'une qu'un honnête homme

¹ M. Charles Gide, dans un article sur *la Guerre et l'Organisation nationale de l'alimentation* (*Revue d'Economie politique*, janvier-février 1916) a montré comment l'organisation de l'alimentation, en France et en Allemagne, a eu précisément pour but de réagir contre le libre jeu de la loi de l'offre et de la demande pour protéger les populations contre l'augmentation excessive des prix. Les moyens auxquels on a eu recours pour réglementer la consommation ont été: 1° le rationnement; 2° la fixation d'un prix maximum; 3° la vente en régie; 4° les sociétés coopératives (d'après l'auteur).

² "Si l'on nous dit que les forces économiques sont amORAles et ne se préoccupent pas de l'équité, écrit M. Paul Bureau, nous répondrons que c'est précisément parce que les forces économiques ne s'inquiètent pas de la justice que nous avons le dessein de nous en préoccuper et que notre souci d'une équitable rétribution, s'il est suffisamment intéressé et persévérant, doit être à son tour une force capable de se mesurer avec les forces économiques et d'amener celles-ci à composition." Extrait d'un remarquable article sur *les salaires et l'idée de justice*, *Revue hebdomadaire*, 17 décembre 1910.

qui peut, veut et qui sait travailler meure de faim, et l'autre, que la femme soit gênée dans les fonctions de la maternité.¹

Cette phrase résume éloquentement la juste doctrine économique et sociale.

III

MÉTHODE DE L'ÉCONOMIE POLITIQUE.

Ces questions économiques, ces phénomènes de la vie matérielle, comment et par quels moyens les étudierons-nous? Quels principes guideront nos recherches? Quelle est la méthode qui nous conduira à la vérité scientifique, et qui, en nous donnant des certitudes, nous poussera dans la voie des réalisations pratiques.²

L'Économie politique n'est pas une science abstraite, comme on le croit trop facilement. Évidemment, il conviendrait d'établir sur ce point quelques distinctions. Des traités d'Économie ont l'apparence de traités d'algèbre. Ils sont, à dire vrai, peu nombreux. On y a mis force chiffres et formules, et d'interminables équations qui chevauchent entre les marges, le long des pages. Les lignes géométriques s'entrecroisent et forment d'étranges arabesques, car on y étudie les courbes et si elles sont concaves ou convexes. Le profane referme ces livres, de découragement:

Vous m'offrez du brouet quand j'espérais des crêmes.

Il demandait des éclaircissements sur des problèmes d'un ordre pratique. On lui répond par *a plus b*. Rien d'étonnant qu'il se lasse, ayant autre chose à faire, le plus souvent, que de rechercher la raison mathématique de la société.

Ce n'est pas le moment de critiquer cette méthode, chère à Stanley Jevons, Walras, Vilfredo Pareto et autres. Elle peut présenter un certain intérêt. Les chiffres sont positifs, inflexibles. Leur alignement

¹ Conférence sur le *Féminisme*, Cf. *La Femme contemporaine*, année 1904.

² Sur cette question de la méthode de l'Economie politique, on peut consulter les ouvrages suivants: Jean Ray: *La Méthode de l'Economie politique d'après John Stuart Mill* (Tenin, 1914); J. E. Cairnes: *Le Caractère et la Méthode logique de l'Economie politique*. (Giard, 1902); divers auteurs: *De la Méthode dans les sciences*, en particulier les chapitres consacrés à la *Sociologie* (E. Durkheim) et à la *Statistique* (L. March): l'ouvrage comprend deux volumes (Alcan 1909 et 1911); Emile Cheysson: *Le Cadre, l'Objet et la Méthode de l'Economie politique* (*Oeuvres choisies*, tome 11, pp. 39 et suiv.; Rousseau 1911); F. Le Play: *La Méthode d'observation* et *La Méthode sociale*; François Simiand: *La Méthode positive en Science Economique*; Pierre Méline: *Le travail sociologique. La Méthode*.

est rigide autant qu'impressionnant. Si donc le nombre, par une gymnastique savante et sûre, établit la vérité d'une loi économique, il apporte à la science un appui sérieux; il constitue une sorte de démonstration ultime, indiscutable, un *dernier* argument. Il pose l'esprit sur une base inébranlable. On peut même, se dit-on, démontrer ce fait par une opération mathématique; et on en conçoit plus de sécurité. Les lois de la vie et de la mort ont été mises en *tables*. Le hasard même, ou ce que l'on croyait être tel, obéit à des principes qui n'ont rien de capricieux et que les géomètres se flattent d'avoir fixés.—Il se peut.

Doit-on croire pourtant que l'étude des phénomènes économiques nécessite une connaissance approfondie des barres et des ronds? Rien de tel.¹ L'Économique n'est pas, essentiellement, une science abstraite. Elle est avant tout une science d'observation. Elle est très proche de la vie qu'elle s'efforce à pénétrer. Elle tient compte d'abord des *faits* et, si elle énonce des principes, c'est à la condition de les étayer d'observations nombreuses et variées.

Il n'en fut pas toujours ainsi. Les premiers économistes ont été trop souvent de purs théoriciens. Ils se tenaient éloignés de la réalité, cultivant leurs idées dans leur cabinet de travail. Ils posaient d'abord une loi, en suivaient les répercussions et concluaient à sa rigidité. Leur a-t-on assez reproché leur tour d'ivoire et cet *homo economicus*, qu'ils ont imaginé pour le nourrir de leurs abstractions! Ils ont été la cause que l'on a fait à l'Économique ce reproche, dont elle a eu tant de mal à se justifier, d'être une science inhumaine, impassible au milieu des misères qu'elle constate, si même elle ne les a pas suscitées.

Mais ces auteurs écrivaient pour leur époque. Ils ont été soucieux de liberté, réclamant le libre jeu de ces lois naturelles auxquelles il leur paraissait que l'univers est inéluctablement soumis. De fait, des contraintes de toutes sortes gênaient l'essor économique. Partout des barrières s'élevaient. Les économistes luttèrent là contre. Ils réussirent, non sans peine, et gagnèrent petit à petit que le champ de l'initiative fût élargi et que certaines libertés fussent reconnues: liberté du travail, liberté du commerce intérieur, puis du commerce extérieur. Adam Smith écrivait sans trop d'espoir: L'Angleterre était bardée de protection. Pourtant, peu après la mort du philosophe économiste, ses idées triomphaient: Huskisson accomplissait ses premières réformes tarifaires, et Cobden engageait la lutte, à la tête de la Ligue de Manchester, pour l'abolition des *lois-céréales*.

Ces premiers théoriciens ont secoué l'opinion. Leur influence fut considérable. Ils ont, en libérant la concurrence, précipité

¹ Cf. Fernand Faure: *Eléments de Statistique* (Larose, 1906) p. 59.

l'avènement de l'industrialisme moderne. Fort bien. Cependant cet industrialisme n'alla pas sans inconvénients. La liberté, poussée à l'extrême, érigée en précepte intangible, parut intolérable, néfaste, ruineuse. Il fallut réagir et ne plus se contenter du *laissez faire*. On réclama l'intervention de la loi dans le domaine économique: la concurrence fut limitée, le travail réglementé, l'industrie surveillée. Malgré cela quelques auteurs n'abandonnaient pas d'être optimistes. Ils prêchaient quand même la théorie pure et l'harmonie naturelle des intérêts, et croyaient trouver dans une doctrine transcendante, abstraite, nécessaire, la source des énergies productrices. Qui voudra s'en étonner? On ne répudie pas facilement sa propre pensée, on ne se détache pas subitement de ses opinions. Les théories ont la vie dure.

Ce mépris des faits n'existe plus. Au contraire, le fait nous fascine et nous retient uniquement. Auguste Comte le mit à la mode; Frédéric Le Play partit, à travers le monde, à sa recherche; Taine le porta sur ses fiches avec la patience d'un collectionneur; Pasteur le poursuivit jusque dans les infiniment petits; Claude Bernard se fit le critique avisé de la science expérimentale; tandis que Flaubert et toute l'école réaliste s'efforçaient à faire des romans avec ces fameuses tranches de vie qui exaspéraient tant Ferdinand Brunetière. Depuis, la science a continué de s'attacher à la réalité. Rien autre ne la préoccupe d'abord. Elle n'aime plus guère les hypothèses depuis que celles qu'elle a échafaudées sur des bases trop grêles menacent de s'écrouler ou s'écroulent effectivement. Elle part des faits et non plus tant des idées. Elle observe avant que de généraliser. C'est une toute autre méthode et c'est la meilleure.

L'Économie politique est donc une science d'*observation* qui prend son bien dans la réalité. Nos pas, hâtons-nous de le dire, que le *raisonnement* en soit banni. Recueillir des faits pour le seul plaisir de les accumuler serait un travail fastidieux et vain. On doit les grouper, les coordonner, les analyser, les juger. L'herboriste est un classificateur: il range ses herbes mortes et son herbier contient des espèces soigneusement étiquetées, en ronde, au haut des pages. L'intellect éclaire le soin de ce savant. Le collectionneur même ne recherche pas seulement la satisfaction de la douce manie. Il ordonne, il catalogue avec amour. S'il poursuit partout et avec une infatigable persévérance la pièce qui lui manque, c'est précisément qu'elle doit ajouter à l'harmonie logique de cet ensemble: une collection! Quoi qu'on accomplisse, le raisonnement est un guide nécessaire. C'est le fil conducteur. Il dégage la pensée de la succession des faits.

Comment l'économiste parviendra-t-il à isoler ces faits, matière première de ses études? Peut-il faire des expériences, ou, plus

exactement, des expérimentations ? Le chimiste a ses cornues : il peut suivre à volonté les réactions fatales qu'il provoque et qui s'opèrent sous ses yeux, suivant des lois naturelles dont beaucoup lui sont encore inconnues. Mais l'économiste saurait-il pétrir de l'humanité dans quelque gigantesque creuset ? Non. L'objet de son observation, c'est l'être vivant, volontaire, changeant, presque insaisissable, au moins dans sa totalité. La société obéit à des lois qui ne sont pas toutes des lois physiques. Le mouvement économique résulte de forces variées, qui sont physiologiques, intellectuelles, sentimentales. Comment tenter une expérimentation sur de pareils éléments et les placer dans des conditions telles qu'ils ne se modifient pas d'eux-mêmes à l'instant précis où on croit les tenir ?

Cependant des foules d'événements ont la valeur au moins de l'expérience, une valeur relative mais suffisante quand elle est multipliée. Il n'est même pas impossible absolument de tenter directement une expérience sociale. On l'a fait souvent et avec des résultats appréciables, concluants. On entend répéter que la Nouvelle-Zélande est un *laboratoire d'expériences sociales*; le livre récent d'un chargé de mission, M. Henri Charriaut, porte ce titre suggestif : *La Belgique moderne, terre d'expérience*; il existe un Institut international pour la diffusion des expériences sociales, qui a son siège à Paris; enfin l'*Action Populaire* de Reims, prototype de notre *École Sociale Populaire* de Montréal, n'a pas d'autre but que de montrer ce qui s'est fait et, par conséquent, de révéler, de vulgariser des expériences. Les colonies socialistes du Nouveau-Monde sont célèbres. Elles ont été nombreuses et ont subi le même sort, échouant lamentablement. Toutes les lois sociales actuelles sont des expériences. Il arrive que, peu après les avoir promulguées, il faut les remanier profondément : c'est le signe que l'expérience n'a pas complètement réussi et que l'on doit recommencer. La leçon n'en demeure pas moins.

L'observation proprement dite remonte dans le passé ou s'en tient à l'actualité; elle s'appuie sur l'histoire ou se contente de suivre les manifestations économiques du monde contemporain.

L'*histoire* est d'un grand secours. Non pour y chercher que l'instabilité est la condition nécessaire du devenir social, mais pour en tirer des exemples, des preuves, des leçons, une sauvegarde. Certains économistes font grand état de leurs connaissances historiques. Ils en ont exagéré sans doute l'importance et l'utilité; mais ils ont été des rénovateurs. Toutes les écoles font leur profit de ces études. La vie économique des sociétés disparues a été lentement reconstituée. C'est une résurrection précieuse. Les peuples primitifs n'ont pas échappé aux longues recherches des savants. On leur a demandé de nous éclairer sur les origines de la production. La géologie et la

paléontologie aidant, le milieu préhistorique nous est apparu. Les fossiles racontèrent une époque lointaine, perdue: livres de pierre où se retrouvaient, incrustés, les premiers outils de l'homme, c'est-à-dire son premier capital, grossier et gigantesque. On suivit les développements ultérieurs de ce stade initial, simple et barbare, dont on retrouve quelque chose chez les peuplades non civilisées qui subsistent encore. On voulut préciser les raisons du long et pénible travail de perfectionnement accompli par l'humanité à travers des siècles de résistance et de conquête. Quelques grands principes parurent y avoir présidé: la division de l'effort, l'échange, la monnaie, l'association. Les étapes de l'industrie moderne furent définies, racontées. Admirable victoire qu'un siècle, grand entre tous, devait achever et rendre durable. Nous parlions tantôt d'expériences: le passé en est fait.

Notre histoire canadienne, étudiée de ce point de vue, nous révélerait des choses intéressantes, encore mal connues. Voilà une source féconde de travaux et d'études. Nous avons eu beaucoup d'historiens. Tous paraissent se complaire de préférence au récit de nos luttes militaires et de nos attitudes politiques. L'histoire du Canada économique est encore à faire. M. Émile Salone, dans son admirable ouvrage sur la *Colonisation de la Nouvelle-France*, a posé un premier jalon. M. Chapais a écrit sur *Talon* un livre classique et définitif. Il montre les efforts de l'Intendant à développer la colonie par l'utilisation logique de ses forces productrices. Que de choses Champlain et Talon nous enseignent! Nous pourrions indiquer d'autres oeuvres de valeur, malheureusement éparses. La synthèse n'a pas été tentée que l'on devrait tirer de ces travaux isolés et de documents inédits. Une période surtout apparaît délaissée: celle qui s'étend de la Cession à la Confédération, de 1763 à 1867. Il y a là un siècle à connaître, à juger. Deux événements importants s'y sont produits: l'application du libre-échange en Angleterre et, par contre-coup, la libération complète de notre marché. Ces deux faits ont-ils exercé pleinement leur influence? Ont-ils été gênés dans leurs répercussions par notre situation politique, encore mal assise? Nous le croyons: il faudrait le démontrer. Les Anglais s'y sont essayés. Pourquoi pas aussi quelqu'un des nôtres, si celui-là—puisque c'est hélas, la condition première—en a le loisir?

Reste l'actualité prise sur le vif, suivie, guettée au jour le jour. Le champ en est vaste, et l'économiste doit y exercer largement son activité. Étude difficile, étendue, constamment arrêtée par des problèmes nouveaux qui surgissent, et compliquée par l'intervention de l'homme, facteur intelligent et libre.

L'économiste doit pénétrer ces phénomènes, les analyser, les décomposer, les répartir, pour les soumettre à une observation plus

minutieuse. Comment pourra-t-il embrasser dans son ensemble et scruter jusque dans ses recoins cette formidable vie ? Par l'observation continue, attentive, avertie, méthodique. Il étudiera sur place, s'il le peut, en prenant part au mouvement industriel, commercial et financier; en aidant les initiatives sociales; ou en parcourant les pays, pour interroger les races, les milieux, les climats, les habitudes. Si ces enquêtes personnelles ne lui suffisent pas, il dépouillera celles que conduisent les gouvernements, les institutions, les simples groupes. Elles ne sont pas toujours sûres: il en corrigera les tendances. Enfin il alignera les *statistiques*, dont on peut tirer grand parti et même *tous les partis*. Arme dangereuse à manier et qui fait pointe de tous côtés. Rümelin, écrit M. André Liesse dans sa *Statistique*, comptait déjà, il y a quarante ans, soixante-trois définitions de la statistique. On connaît celle-ci, que le public a tout de suite retenue: "la statistique est l'art de préciser ce qu'on ignore." Il faudra donc vérifier les chiffres et les admettre avec une précaution extrême. Bien compris, ils serviront; ils révéleront tout d'un pays, ses besoins, sa vigueur, ses malaises, ses faiblesses.

Par tous ces moyens, et d'autres encore, l'économiste parviendra à grouper des faits nombreux sur lesquels il appuiera son jugement, ses doctrines. Il pourra dès lors risquer une idée générale et la croire solide, scientifiquement. Tous ces tâtonnements engendreront une certitude, au moins relative; car on ne saurait tout demander à l'esprit humain, quand les plus fières théories, celles qui paraissent définitives, celles qui donnaient à l'humanité une orgueilleuse confiance en son génie, nous échappent sitôt que formulées, et sont renversées par une découverte inattendue, déconcertante, peut-être elle-même illusoire.

Mais nous observons peu, trop peu, quand la réalité est là, près de nous, à portée de notre esprit. "Quelle est la couleur de la pomme de votre escalier?" demandait un critique à un jeune romancier, venu lui confier l'ambition de ses rêves. Observer, regarder, comprendre, retenir, ainsi se tisse l'expérience. Les faits nous entourent. Nous les subissons. Ils nous forcent la main. Chacun porte en lui une leçon, l'application de quelque principe, un morceau d'idée, de vérité. Profitons-en. Quiconque, au lieu d'agir machinalement, soumettrait sa volonté à cette discipline, l'observation, verrait du même coup s'éveiller sa pensée et s'illuminer sa tâche quotidienne. Que le comptable s'en tienne à la comptabilité, puisque, aussi bien, il la connaît mieux; qu'il en sache le rôle et l'utilité. Il bâtit en chiffres toute une entreprise: qu'il ne se contente pas de poser des signes, qu'il les suive plutôt, au-delà de leur expression numérique. Que le commerçant étudie le commerce, puisque c'est sa profession. Les transactions de chaque heure, s'il les surveille bien, lui apprendront

des choses qu'il ne soupçonne peut-être pas. Il accepte des lettres de change, il signe des chèques, il escompte des billets à ordre. Ces effets lui sont familiers. Ils sont tout le crédit: s'y arrête-t-il? Que l'industriel reporte tout son intérêt sur sa fabrique. Il en est le maître, il doit en posséder jusqu'au moindre rouage. Pour lui, c'est servir sa fortune que de devenir une "autorité sociale." Est-il au courant des méthodes, des procédés de production? S'il avait à défendre son usine et tout ce qu'elle représente, le pourrait-il? L'industrie, c'est l'union fertile et créatrice du capital et du travail, c'est un élément de la richesse nationale; y pense-t-il? Veut-on encore un exemple? Le médecin exerce un art très noble, à la vérité. Chaque vie qu'il conserve, qu'il sauve, est acquise à la société. Force de travail, elle s'ajoute aux autres, grâce à ses bons soins. Ainsi ses actes ont des répercussions prolongées et contribuent, en définitive et dans leurs aboutissants, à la conservation de la richesse économique la plus appréciable: l'être humain. Combien le veulent savoir, combien s'y intéressent vraiment? Bref, que chacun s'attache à sa spécialité, autrement que pour devenir un bon ouvrier.

Avant d'en arriver là, il faut s'être préparé de longue main par l'exercice de ses facultés d'analyse et par des lectures appropriées. Impossible autrement de diriger ses recherches avec sûreté. L'esprit a besoin de cette règle. Où la chercher? Qu'à cela ne tienne: il y a les traités qui sont des expositions de doctrines. Commençons lentement, par ceux qui habillent d'un tissu léger la table des matières. Il existe des brochures, de simples plaquettes: le traité de M. Emile Levasseur ou celui de M. Rubat du Mérac.¹ Ces quelques principes amorceront la curiosité et le goût de plus amples recherches. Puis, par gradation, et suivant l'appétit, on consultera les traités de MM. Paul Leroy-Beaulieu, Charles Gide, Paul Beauregard, Hervé Bazin (qui date un peu, mais qui vaut par la clarté des exposés), Charles Antoine (déjà volumineux), André Liesse;² et, plus tard encore, les grands travaux, les oeuvres de longue haleine, soit traités, soit monographies, de la plupart des mêmes auteurs et de quelques autres, comme MM. de

Emile Levasseur: *Notions d'Economie politique*, Hachette; Rubat du Mérac, avocat à la Cour d'Appel (Paris), *Principes d'Economie politique et Principes d'Economie sociale* (Collection *Science et Religion*, chez Bloud, Paris).

² Emile Levasseur: *Précis d'Economie politique*, chez Hachette, 1906; Paul Leroy-Beaulieu; *Précis d'Economie politique*, chez Delagrave; Charles Gide: *Principes d'Economie politique*, chez Larose et Tenin (cet ouvrage, traduit en anglais, a été publié et répandu aux Etats-Unis, où il fait autorité); Paul Beauregard: *Eléments d'Economie politique*, chez Larose et Tenin; Hervé Bazin: *Traité élémentaire d'Economie politique*, chez Lecoffre, 1896; Charles Antoine, S.J.: *Cours d'Economie sociale*, chez Alcan, 1905; André Liesse: *Leçons d'Economie politique*, chez Giard et Brière; Joseph Rambaud: *Eléments d'Economie politique*, chez Larose et Tenin.

Foville, Daniel Bellet, Auguste Arnauné, René Stourm, Emile Cheysson, Auguste Béchaux, C. Colson, Georges Blondel, Raphael G. Lévy; sans compter les classiques et les auteurs anglais et américains.¹ La théorie acquise, nous avons une vue d'ensemble. Dès lors, la spécialisation devient chose relativement facile. Chacun rayonnera vers l'objet de son activité, dont il apercevra la place dans l'ensemble imposant des activités totales. Voudra-t-on, par exemple, étudier le commerce extérieur du Canada? Sitôt, la théorie nous viendra en aide pour bien délimiter la question, pour y voir clair: pour distinguer les exportations et les importations, en établir le rapport; rechercher la part de chaque pays dans les transactions du commerce général; analyser de plus près ce que nous vendons et ce que nous achetons, et prouver qu'acheter n'est pas nécessairement s'appauvrir; compulser les chiffres et les soupeser; conclure à un redoublement d'activité dans certaines directions. L'expérience fournira le reste.

Enfin, il y a chance pour que nous trouvions ces ouvrages nécessaires là où normalement ils doivent se trouver: dans les bibliothèques. Jusqu'ici, on leur a demandé surtout des oeuvres d'imagination: la proportion des romans et nouvelles est formidable dans la distribution quotidienne des livres aux lecteurs assidus. Est-ce un mal? C'est, dans tous les cas, déjà lire. Ce qui vient du roman s'en va souvent par le roman. Cela passera en partie. Nos bibliothèques possèdent une quantité appréciable d'ouvrages et de revues techniques. Il n'y a qu'à s'en rendre compte par soi-même. Autrefois, il fallait courir à Boston pour se renseigner sur un point de notre histoire économique. Il n'en est plus ainsi. Le mieux, c'est que ces ouvrages sont demandés, qu'ils sont lus. C'est un commencement. Plus nombreux chaque jour seront les chercheurs qui s'intéresseront aux questions actuelles, si importantes pour nous Canadiens français. Ce sera la contagion du bon exemple. Que chacun se donne rendez-vous pour préparer, dans le silence des bibliothèques, l'oeuvre de résistance, de défense et d'attaque. Heures recueillies d'où sortiront

¹ Paul Leroy-Beaulieu: *Traité théorique et pratique d'Economie politique*, quatre volumes, chez Alcan; Charles Gide: *Cours d'Economie politique*, chez Larose; C. Colson: *Cours d'Economie politique*, six volumes, chez Alcan; Joseph Rambaud: *Cours d'Economie politique*, deux volumes, chez Larose et Tenin; Ch. Brouillet: *Précis d'Economie politique*, un fort volume, chez Pierre Roger et Cie; Alfred Marshall: *Principes d'Economie politique*, deux volumes, chez Giard et Brière; MacCulloch: *Principes d'Economie politique*, chez Guillaumin; J. B. Clark (Ecole mathématique): *Principes d'Economie politique*, chez Giard; G. Leacock: *Elements of Political Science*, Boston, Houghton Mifflin Co., 1913; James Mavor: *Applied Economics*, Toronto, Alexander Hamilton Institute; Garner, James Wilford, *Introduction to Political Science*, N.Y., American Book Co. Les ouvrages de Seligman, Taussig, Fisher, Schmoller, Wagner, Roscher, Brants, Pareto, etc.

mieux que des paroles: des idées et des actes. Puissions-nous ainsi, avec le temps et l'étude, réaliser le mot de Maurice Barrès: "La sève nationale aujourd'hui est en émoi, et voilà que les individus pensent généreusement."

L'économie politique n'est donc pas une science abstraite, mais pratique, intéressée, humaine. Son but n'est pas matériel uniquement. Elle est une sociologie. Elle veut faire, autant qu'il est en son pouvoir, le bonheur des hommes. Elle prêche la paix, l'activité,— la vie.

III

INTÉRÊT ET UTILITÉ DE L'ÉCONOMIE POLITIQUE.

M. Thiers disait, en 1850: "L'économie politique est un genre de littérature plus ennuyeux que les autres." Il oubliait, pour le plaisir de faire un mot, les articles étincelants d'esprit narquois et sarcastique de l'auteur des *Harmonies Économiques*, Frédéric Bastiat qui fut l'égal de Paul-Louis Courier et le plus rude adversaire de Proudhon. Ces mots de grands hommes sont amusants. Ils passent d'autant plus facilement à la postérité que c'est elle, le plus souvent, qui les inventa. Celui que l'on attribue à M. Thiers est bénin. S'il le prononça vraiment, c'est qu'il avait conçu de l'humeur des attaques dirigées contre lui par quelque obscur blasphémateur sociologue. Il ne faut pas tenir rigueur aux politiques: ils sont des hommes et qui le prouvent. Et puis, M. Thiers a fourni là une citation facile à ceux qui veulent écrire sur la science économique. Son mot se place bien. Il se revêt de l'autorité d'un homme d'État célèbre; et c'est un double plaisir de la rappeler pour montrer aussitôt combien il est injustifié.

L'Économie politique n'est pas une science ennuyeuse. Certes, telles oeuvres d'économistes ne sont pas exemptes de longueurs ni d'obscurités. Il en est même qui sont; de ce point de vue, déconcertantes. On lit très peu, si même on consent encore à le lire, le *Tableau Économique*. Il est souvent incompréhensible, et les plus assurés ne s'y sont pas attaqués impunément. De même l'économiste anglais, David Ricardo, n'a pas toujours su trouver le chemin de la clarté. Il est de ceux qu'il faut relire. Ce sont là des exceptions. La plupart des économistes ont recherché la forme. Adam Smith et Turgot ont été des écrivains agréables et goûtés, autant que des économistes sévères. L'ouvrage de Necker sur les *Finances du Royaume* exerça un singulier attrait: on raconte même que les femmes, en le lisant, versaient des larmes abondantes.

Le XIX^e siècle a produit une pléiade d'économistes, restés célèbres autant par leurs doctrines que par leur façon de les traduire, à la fois élégante et sobre. Cette science ennuyeuse a même nourri l'éloquence. Les questions économiques et sociales ont été portées à la tribune. Faut-il citer les discours de Lamartine, de M. Thiers même, de Montalembert, de M. de Villèle, d'Émile Ollivier, de Gambetta, de Waldeck-Rousseau, du comte de Mun, de M. Clémenceau, de Jules Roche, du sénateur Méline, d'Alexandre Ribot, de Jules Delafosse, de Paul Deschanel, et de tant d'autres? Faut-il rappeler les succès rententissants de Richard Cobden et de John Bright? Je citais plus haut Frédéric Bastiat. Il fut un journaliste plein de couleur et d'à propos. Sa *Pétition des Fabricants de Chandeliers*, réclamant le régime des volets fermés à cause de la concurrence que leur fait le soleil, est demeurée classique à bon droit. M. Léon Say, ministre des finances, a su communiquer de la vie aux questions les plus arides. Son style est riche, alerte, juste et précis.

Parmi les économistes français contemporains, comment ne pas mentionner au premier rang M. de Foville, M. Stourm, M. Paul Leroy-Beaulieu, M. Charles Gide, M. Emile Cheysson? M. de Foville fut Secrétaire perpétuel de l'Académie des Sciences morales et politiques. Ses rapports annuels étaient attendus impatiemment. Le livre qu'il a consacré à la *Monnaie* est rempli de souvenirs personnels, d'allusions historiques, de citations heureuses. M. René Stourm hérita des qualités de M. Léon Say. Ses ouvrages sur le *Budget* et les *Systèmes d'impôts* sont des modèles d'exposition. M. Paul Leroy-Beaulieu est plus connu. Pour plusieurs, il incarne l'Économie politique. De fait, il a beaucoup écrit. Ses livres sur le *Collectivisme*, *l'État moderne et ses Fonctions*, la *Colonisation chez les Peuples modernes* sont aussi intéressants que ses grands traités. Il évite avec soin d'être sec. Il multiplie les détails. Il est exact sans raideur. M. Charles Gide, chargé du cours d'Économie sociale à la Faculté de Paris, est aussi de ceux qu'il faut relire, mais avec plaisir et profit. C'est un philosophe autant qu'un économiste et qui s'exprime avec l'aisance d'un professeur de littérature. Esprit ouvert et curieux, il n'est pas de question nouvelle qu'il ne discute. Ses manuels contiennent la synthèse des connaissances économiques. Ils sont remarquablement composés. Ce sont des livres de chevet. M. Cheysson, mort il y a six ans, avait été secrétaire de Frédéric LePlay. Il fut lui-même le type de l'ingénieur social. D'une activité extraordinaire, il prêta sans compter l'appui de son érudition, de son expérience, de son amour des humbles et des déshérités. Il était partout. Sa parole était sincère et douce. Il émaillait volontiers ses discours de réminiscences littéraires ou de comparaisons techniques. Nous ne

pouvons nous rappeler son enseignement sans une profonde émotion. Il est de ceux dont on demeure toujours le disciple.

Il convient d'arrêter là cette nomenclature qui serait longue encore s'il fallait la compléter. Nous avons passé sous silence des sociologues de grand renom: Auguste Comte, singulièrement fécond, Frédéric LePlay, Hippolyte Taine et, plus près de nous, Étienne Lamy, le délicieux auteur de la *Femme de demain*, Georges Goyau, qui consacra ses recherches patientes et lumineuses à l'étude de l'évolution des idées et des partis en Allemagne, Victor Giraud, portraitiste des *Maîtres de l'heure*, et enfin, Anatole Leroy-Beaulieu, membre de l'Institut et directeur de l'École des Sciences politiques. Nous avons applaudi, il y a quelques années, M. Anatole Leroy-Beaulieu, lors de son court séjour à Montréal. Il aurait rimé quelques vers, au début de sa carrière, conservé au fond de ses tiroirs une ébauche de roman, comme naguère Taine et Renan, que nous n'en serions pas étonnés. Aucun homme ne possédait mieux que lui ce que l'on est convenu d'appeler la politique *mondiale*. Il s'était renseigné sur place. Il avait visité le monde dont il parlait. Il connaissait, peut-être mieux que le Czar, l'Empire de toutes les Russies. Il était, par dessus tout, épris de justice. C'était un modéré qui eût voulu voir régner dans la société la paix au sein de l'ordre respecté. Il faut relire sa conférence sur le socialisme et ce qu'il appelle les "doctrines de haine." Ces pages sont éloquentes, animées d'un souffle large, et dégagées de toute préoccupation de caste. Avec la plus grande autorité, M. Leroy-Beaulieu continua l'oeuvre de régénération commencée par M. Boutmy, au lendemain de la guerre de 1870. Ce fut un sage dans la pleine acception antique du mot.

Ce fait nous paraît caractéristique que la littérature elle-même s'est tournée vers la Sociologie et l'Économie politique, pour y puiser. Le roman est devenu social ainsi que le théâtre. Les écrivains se sont complus dans la description détaillée, et le plus souvent attendrie et sympathique, des maux dont souffre notre société. L'emploi de jeune premier ou de grand premier rôle, tenu jadis par un gentilhomme, un ingénieur ou un explorateur retour d'Afrique, est aujourd'hui dévolu à l'industriel, au paysan, parfois au simple manouvrier.

Nous voulons indiquer seulement cette tendance nouvelle de l'effort littéraire. Les romanciers sont vraiment des manières de sociologues. Ils brodent sur des thèmes sociaux, et leur imagination n'en paraît pas toujours alourdie. Leurs personnages discutent, près de la cheminée, sur des sujets graves. On parle salaire, grève, hygiène, retraites ouvrières, syndicats. Le féminisme est une mode. Il y a toujours, fourvoyé quelque part, un théoricien socialiste à qui le futur ministre obligé de tous les romans donne une réplique non-

chalante. C'est le nouveau petit frisson. Les foules même ont envahi la littérature. On leur a découvert une psychologie qu'elles ne se soupçonnaient pas. Paul Adam aime les manier et le théâtre d'Emile Fabre en déborde. Allons plus loin. Il y a des romans qui sont d'abord des thèses ou des oeuvres de combat. Voyez les *Morts qui parlent*, *l'Etape*, *la Terre qui meurt*, *la Peur de vivre*, *l'Homme qui a perdu son moi*, *le Flambeau*. Eugène Brieux est un dramaturge doublé d'un conférencier. Enfin, signe encore plus évident, la même année, l'un tout près de l'autre, Paul Bourget et René Bazin publiaient, l'un *Sociologie et Littérature*, l'autre les *Questions littéraires et sociales*.

Nous touchons ainsi aux critiques. Par une sorte de réaction, ils ont emboîté le pas. Emile Faguet écrivit des livres de doctrine, en même temps que des chroniques théâtrales; et si René Doumic est resté plus rencogné, s'il s'est tenu plutôt sur le domaine littéraire, il ne pouvait pas, étudiant l'oeuvre de Georges Sand, oublier qu'elle fut féministe à la mode romantique et qu'elle imagina, tout comme Balzac, les premiers romans sociaux. Faut-il enfin rappeler Ferdinand Brunetière et qu'il ne crut pas déroger à son rôle de critique en devenant un des plus vigoureux sociologues des temps présents?

Les lettres consacrèrent donc l'Economie politique que vouait au perpétuel ennui l'insoucieux dédain de M. Thiers. L'Economie pouvait-elle espérer être ainsi vulgarisée par l'art? Elle en est comme rajeunie. L'art même n'a rien perdu: il s'est renouvelé.

Mais, si attrayante qu'elle soit, l'Economie politique est-elle une science utile, une science pratique, dont les principes peuvent déterminer ou guider les énergies et susciter des initiatives; ou bien est-elle une de ces sciences dites de culture générale, qu'il est agréable de connaître dans leurs grandes lignes parce qu'elles ajoutent à nos connaissances et qu'elles agrémentent l'esprit? N'est-elle même qu'un ensemble de théories sans application possible?

Nous prisons peu les idéalistes, si même nous ne les redoutons pas. Nous opposons volontiers le prestige et les certitudes de la pratique aux prétendues vanités de la théorie. Ce dédain s'explique chez des hommes qui sont formés aux décisions promptes d'où l'influence des idées paraît bannie. Cependant il est injustifié. Nous cédonc ainsi à un préjugé trop répandu. La pratique et l'art sont une réalisation des énoncés scientifiques. C'est là un truisme. Les théories se transforment en énergies; elles deviennent des forces agissantes. M. Paul Gaultier observe avec raison que les ponts sont d'abord une mathématique:¹ leur charpente idéale fut construite

¹ "Toute vérité, si théorique soit-elle, a des conséquences pratiques plus ou moins lointaines, qui en découlent et qui en sont l'épreuve. Nous avons d'autant plus

abstraitemment par un calcul des résistances. Image exacte qui nous fait comprendre comment les idées peuvent se matérialiser, comment les théories prennent corps dans la réalité. Il en est ainsi dans tous les domaines de l'activité;¹ mais ce travail de germination est plus ou moins lent et il n'apparaît pas toujours dans ses résultats immédiats. "Il arrive de temps en temps aux philosophes d'éveiller l'attention du grand public, écrivait M. André Chaumeix à propos d'Emile Boutroux. C'est un hommage que le public rend aux savants. Il avoue ainsi que les philosophes ne se livrent pas à un pur jeu d'esprit et que leurs conclusions ont une influence sur notre vie. Il répand les idées, au besoin en les déformant. En les faisant tant bien que mal passer dans le monde, et en les exposant au contrôle de l'expérience, il les aide peut-être en fin de compte à accomplir leurs destinées."²

On sait, d'ailleurs, quel parti M. Alfred Fouillée a voulu tirer de ce qu'il appelait les *idées-forces* et comment il a fondé sur la puissance de pénétration des idées, sur leurs résonnances intimes et profondes, son intellectualisme moral. Il ne faut rien exagérer. Les idées ne sont pas les mobiles uniques et nécessaires de la volonté. L'homme obéit au sentiment autant, sinon plus, qu'à la raison. On s'étonne même que la philosophie contemporaine s'attribue tant de mérite à cause d'une aussi vieille découverte. Si l'idée seule conduisait le monde, rencontrerait-on tant d'indifférence pour le bien chez les plus cultivés et d'aussi belles ardeurs chez d'humbles ignorants?³ Encore conviendrait-il de rechercher si l'individu saurait trouver en lui-même une règle de moralité. Ce fut la doctrine optimiste du XVIII^e siècle. Elle faisait grand état de cette fameuse bonté naturelle de

confiance dans nos mathématiques qu'elles servent à construire des ponts et à combiner des machines." Paul Gaultier: *La Pensée contemporaine, les grands problèmes*, p. 298 (Hachette 1911).

¹ Nul plus que Ferdinand Brunetière n'a cru à cette action des idées. Dans ses *Discours de Combat* (première série, p. 10, *La Renaissance de l'Idéalisme*) il cite avec une évidente satisfaction cette pensée de Claude Bernard, qu'il accompagne d'un, éloquent commentaire: "Il faut bien se garder de proscrire l'usage des idées et des hypothèses. On doit, au contraire, donner libre carrière à son imagination; c'est l'idée qui est le principe de tout raisonnement et de toute invention; c'est à elle que revient toute espèce d'initiative. On ne saurait l'étouffer ou la chasser sous prétexte qu'elle peut nuire." Il dit ailleurs: "Le progrès scientifique et intellectuel ne consiste peut-être qu'à transformer en vérités courantes et banales des idées qui furent, à leur heure, originales, téméraires et blasphématoires." *Discours académiques*, p. 295, *Réponse au Discours de réception de M. Paul Hervieu*.—Cf. également le *Manuel de l'Histoire de la Littérature française*, p. 108, et surtout l'étude sur le "Disciple" de Paul Bourget (*Nouvelles Questions de Critique*, p. 330).

² André Chaumeix: *Les idées de M. Emile Boutroux*, *Revue hebdomadaire* du 20 avril 1912.

³ Cf. J. Bourdeau: *La philosophie affective*, pp. 113 et suiv. (Alcan 1912).

l'homme contre laquelle se dresse aujourd'hui, en contradiction, toute la philosophie évolutionniste qui retrace jusque chez le singe primitif l'humiliante origine de nos instincts.¹ Et puis, pour une ou deux âmes d'élite, combien d'être dépouillés de tout mobile élevé subissent passivement l'emprise de leurs passions?—Mais le mot de M. Alfred Fouillée a fait fortune. Sur cette même donnée spéculative, un puissant dramaturge français, M. Henry Bataille, a drapé une haute comédie, les *Flambeaux*, qui sont encore et toujours des idées dont la lueur lointaine guide vers des régions ignorées l'espoir désintéressé, le rêve humanitaire du savant.

Revenons à la sociologie. La chronique scientifique nous fait toucher en quelque sorte ce point de contact entre la science et la pratique. Au mois d'août 1912, le premier Congrès international eugénique se réunissait, à l'Université de Londres, sous la présidence du major Léonard Darwin, fils du grand philosophe. *L'Eugénique* est une science nouvelle que son fondateur, Sir Fr. Galton, a définie en ces termes: "L'étude des causes, soumises au contrôle social, pouvant améliorer ou affaiblir les qualités de race des générations futures, soit mentalement soit physiquement."² La plupart de ces causes proviennent de l'hérédité ou du milieu social.

Or, même en ce qui concerne les êtres inférieurs, les végétaux par exemple, le phénomène de la transmission des caractères d'un individu à un autre est déjà compliqué et souvent capricieux. "Dans le cas le plus simple, écrit un biologiste contemporain, professeur à la Faculté des Sciences de Toulouse, c'est-à-dire dans le cas de parents semblables et de race pure (*v.g.* un pied de coquelicot se reproduisant par autofécondation), les lois de l'hérédité sont si complexes que c'est à peine si on peut dire qu'il y a des lois. Parmi les caractères, certains seulement sont fixes et se transmettent fidèlement des parents aux descendants. Et encore, pour admettre ce résultat, faut-il supposer que l'espèce est invariable et ne tenir aucun compte des variations lentes dont il est difficile de nier l'existence. Les autres, les caractères fluctuants, varient constamment. Etant donné les caractères des parents, il est impossible de prévoir avec certitude ce que seront les

¹ Cf. Ferdinand Brunetière: "*La Moralité de la Doctrine évolutive.*" Cette étude, reproduite dans le volume intitulé *Questions actuelles* (pp. 99 et suiv.), est une des plus ingénieuses, des plus fortes—et peut-être aussi des plus inattendues—que le grand critique ait laissées.—"La morale et l'éducation même, dit ailleurs cet auteur, ne consistent-elles par aussi, comme la critique, à substituer en nous d'autres motifs de jugement que ceux que nous suggèrent le "tempérament," l'instinct et la nature?"—*Essais sur la Littérature contemporaine*, p. 18.

² Cf. Etienne Louis Drugeon: *Le Congrès eugénique*, dans le *Journal des Débats* (édition hebdomadaire du 9 août 1912) et l'article, très clair, du docteur J. Laumonier, dans le *Larousse mensuel* de juillet 1912.

caractères des descendants. Il n'y a que des probabilités qui elles-mêmes sont variables."¹ Ces incertitudes se multiplient lorsqu'il s'agit de l'homme vivant en société et soumis aux influences de la civilisation, aux actions des milieux divers.² La-dessus la plupart des savants qui ont pris part au congrès eugénique sont explicites. Ils ont reconnu fort honnêtement la relativité de leurs connaissances. C'est un rare mérite; et—ceci dut-il paraître un paradoxe—c'est aussi le seul moyen d'acquérir une certitude scientifique.

Mais cette hésitation du début, ces tâtonnements, cet empirisme nécessaire n'empêchaient pas les savants de poursuivre leurs recherches et de formuler des théories que la critique reprenait à son tour, soit pour les combattre, soit pour les adopter et en faciliter l'énoncé. Ainsi se constituait peu à peu, par l'élaboration d'éléments épars et sans lien apparent, une science des manifestations héréditaires. Au delà de son objet propre et immédiat elle atteignait, par ses conséquences logiques, un but plus lointain: la préservation de la race.

Cette science venait à une heure difficile. Un ensemble de faits économiques d'une extrême gravité en a précipité la réalisation. Dans presque tous les pays, la population recule: le phénomène est constant, encore qu'il ne soit pas partout également sensible. C'est là une des manifestations chroniques de cette *peur de vivre*, si vigoureusement dénoncée par Henry Bordeaux. L'humanité, pour satisfaire ses appétits de jouissance, diminue le nombre et le poids de ses responsabilités. Comment compenser jusqu'à un certain degré cette perte d'énergie? En s'essayant à prolonger la moyenne de vitalité, en réduisant les chances de maladie, en prévenant les accidents professionnels, en assainissant l'habitation, en luttant contre la mort pour conserver l'illusion de la vie, et, enfin, en sauvegardant l'enfance par un redoublement de soins et par l'application rationnelle de ces principes nouveaux qui tranchent le mal dans ses origines et tendent à conserver les forces sociales en les préservant des tares et des dégénérescences héréditaires. Voilà bien le point de contact. "*We are at the beginning of this marriage between science and practice,*" disait

¹ Cf. M. Leclerc du Sablon: *Les Incertitudes de la Biologie*, p. 228 (Flammarion 1912)—D. Parodi: *Le problème moral et la Pensée contemporaine*, p. 6.—Voir également Ferdinand Brunetière, *Etudes critiques*; VI, pp. 20 et suivantes; *Questions de critique*, p. 311; et Emile Faguet, *Propos littéraires*, III, p. 166.

² C'est une des mille taquineries des féministes qui se flattent d'une culture scientifique que de discuter sur les lois de l'hérédité et de la vie, et d'accepter ou de rejeter le fardeau de la transmission des caractères suivant qu'ils sont favorables ou non.—Voir le volumineux ouvrage de M. Jean Finot; *Préjugé et problème des Sexes*, pp. 172 et suiv. (Alcan 1912).

M. Balfour aux congressistes; ce que M. Etienne Louis Drugeon exprimait par une formule plus heureuse et plus précise: "C'est en améliorant à la fois l'hérédité et le milieu que l'idéal eugénique se substituera (il eut peut-être mieux dit: s'ajoutera) à l'idéal philanthropique."¹

Quels seront, en définitive, les moyens dont on disposera pour assurer la réalisation de pareilles idées? Ceux que nous connaissons déjà: les revues, les conférences, les congrès, les prédications de toutes sortes, les initiatives privées, les activités sociales, la loi. C'est le terme, le dernier instrument: il est dangereux et d'un maniement difficile. Les Américains, qui ne manquent pas d'assurance ni d'audace, y ont eu recours sans souci. Ils ont parfois une conception hybride de la liberté et, sous prétexte de garantir l'intégrité du corps social, ils ont tôt fait de sacrifier l'individu. Et puis, ce peuple cède facilement à la superstition du scientifique. Il en tient: il en a mis partout.² Si bien que des parlements provinciaux n'ont pas craint d'imposer au peuple les plus durs principes de l'eugénique: on est même allé, assure-t-on, jusqu'à demander, dans un projet de loi, de débarasser une bonne fois la société de tous ces tarés que l'on appelle, avec un beau dédain scientifique, des déchets sociaux, sans penser que ces déchets sont tout de même des hommes et que, si comme tels ils ont des "droits," ils doivent avoir d'abord et au moins celui de vivre. Herbert Spencer, entraîné par la logique de sa sociologie évolutionniste, avait fait montre d'un pareil emportement contre les hôpitaux qui sont les refuges suprêmes des inutiles. Il s'en était repenti sur le tard et avait arrêté là sa doctrine, sur laquelle il ne laissait pas d'exprimer quelque doute. En France, on s'est montré moins hardi ou plus humain. L'opinion a repoussé ces solutions tranchées et il s'est trouvé néanmoins des esprits pour ne voir là qu'un déplorable sentimentalisme. Le docteur Manouvrier disait fort à propos, lors du congrès eugénique: "Il faut se garder soigneusement de considérer (d'accepter) tout procédé imaginé d'après un procédé scientifique. L'action sociale doit se montrer très réservée." C'est parler raison. Si quelques théories eugéniques sont susceptibles d'améliorer les qualités d'énergie et de résistance de l'espèce, il reste que la société n'est pas une matière malléable à souhait et qu'elle offre au zèle extravagant de certains réformateurs des résistances légitimes.

Une double leçon se dégage pour nous de cette expérience scientifique sur laquelle nous avons insisté à dessein. Celle-ci d'abord que les théories, si éloignées de la réalité, si abstraites et si *philosophi-*

¹ Journal des Débats, loc. cit.

² Voir à ce propos, puisqu'il s'agit ici d'eugénique, un curieux article paru dans le *Outlook*, livraison du 25 janvier 1913, intitulé *Harnessing Heredity*.

ques qu'elles apparaissent de prime abord, ne sont pas, par cela même, condamnées à n'habiter jamais que les sphères de la spéculation pure; cette autre ensuite que les idées économiques et sociales, par leur caractère même, tendent vers l'action, la déterminent, l'imposent. Rendant compte du livre de M. Paul Gaultier sur la *Pensée contemporaine*, M. Henri Chantavoine, l'élégant critique parisien, écrivait: "La science économique a fait de grands progrès, même dans les campagnes qui ne sont plus si réfractaires ni si hostiles aux nouveautés. Les vérités économiques d'aujourd'hui et de demain se sont répandues: il s'y mêle encore, naturellement, une part d'ignorance, d'utopie ou d'illusion; mais l'expérience peu à peu nous éclaire, corrige nos préjugés, redresse nos erreurs, nous guide, comme la meilleure des conseillères, dans la voie sûre et large de l'action."¹ Qu'est-ce à dire sinon que les théories économiques sont par essence des théories pratiques, si ces deux mots peuvent être associés, des *théories-action*, qui incitent l'activité humaine, la dirigent vers les oeuvres et se résolvent finalement en utilités.

V

ACTUALITÉ DE L'ÉCONOMIE POLITIQUE.

Les grandes questions actuelles sont, presque toutes, des questions économiques. "La prépondérance du facteur économique dans la vie générale de l'humanité s'affirme chaque jour d'avantage," écrit M. Georges Blondel. C'est un des traits de notre époque. Cette prépondérance date seulement du siècle dernier. Le progrès matériel, sans nous laisser indifférents, ne nous étonne plus. Il nous a habitués à ses largesses, à sa munificence; mais, si nous jetons un rapide regard en arrière, nous restons stupéfaits de l'immensité de la tâche accomplie en si peu d'années.

Au milieu du XVIIIe siècle, la grande industrie n'existait pas, du moins telle que nous la concevons aujourd'hui. Des entrepreneurs, premiers grands commerçants et premiers capitalistes, distribuaient leurs commandes aux artisans qui travaillaient à domicile. Dans les villes, les petits métiers étaient encore nombreux; en France et dans le nord de l'Europe, ils étaient étroitement réglementés. L'ouvrier s'appelait apprenti ou compagnon; il partageait l'existence du maître, son patron, avec lequel il était en relations journalières. Le marché était borné, restreint, localisé. Le producteur connaissait ses clients et se pliait à leurs exigences. Sans doute, le commerce international s'était développé, puisque de hardis navigateurs traver-

¹ *Les Annales*, 15 septembre 1912, *Revue des livres*.

saient les mers et se livraient au trafic des marchandises entre l'Europe et les pays lointains d'Orient et d'Amérique; mais c'était l'exception. Sur terre, il y avait peu de moyens de communication. Les transports étaient coûteux et des droits élevés frappaient les marchandises au moindre détour. Tous ces marchés, où les grandes foires jetaient parfois une note plus animée, étaient sévèrement surveillés et protégés. Les hommes d'Etat, obéissant à des idées préconçues et très en cours, cherchaient, par des mesures draconiennes, à restreindre les achats faits à l'étranger. Il fallait, pensaient-ils, payer en bons deniers ce qui venait d'ailleurs; et c'était s'appauvrir d'autant que de laisser sortir son or, seule vraie richesse. Ce fut une révélation lorsque, plus tard, Jean-Baptiste Say démontra que les marchandises s'échangent contre des marchandises, et que les métaux précieux n'ont qu'un intérêt secondaire là où la production est active et rapporte.

Tout cela changea quasi brusquement quand la science quitta les sphères élevées de la spéculation et les sombres demeures des alchimistes, pour se mettre au service du travail humain. A partir de 1750, les inventions se précipitent et, grâce à la vapeur qui s'applique aux industries d'abord, aux transports ensuite, l'usine s'élève, s'emplit de machines, regorge d'ouvriers. Au début du XIX^e siècle, l'Angleterre est déjà un pays manufacturier; puis, tour à tour, la France, l'Allemagne, la Suisse, la Belgique, l'Europe. Le progrès passe l'Océan, attiré vers de vastes étendues où tout semble promis à ses audaces: les Etats d'Amérique grandissent, s'affirment, menacent bientôt le Vieux-Monde, longtemps sceptique et soudain troublé. L'Extrême-Orient même s'éveille de sa torpeur séculaire et secoue la chaîne de ses traditions héréditaires. Les distances, que les transports ont vaincues, *dévorées* comme on dit aujourd'hui, ne sont plus des obstacles: après les marchandises, la pensée se déplace. Un simple déclenchement, et tous les points du globe sont en contact. L'industrie règne, maîtresse du monde. Le marché n'a plus de bornes: il subit les répercussions des moindres crises, qui se transmettent, comme des ondes, d'un centre à l'autre. "Un coup de bourse à New-York, écrit M. Gabriel Hanotaux, fait sauter les mailles du plus solide bas de laine provincial. Si un roi du cuivre triomphe ou succombe, l'atelier ou la ferme de mon voisin prospère ou périt. La cote de la Bourse est le graphique des pulsations mondiales." *Mondial*, voilà le mot formé: il est expressif, sinon très élégant; il marque la suprême limite, le point d'arrivée sur un horizon reculé, immense. Par delà, ce sont les astres: l'homme s'y achemine.

De cet essor financier, industriel, commercial, une politique nouvelle est née. Les théories anciennes n'étaient plus de force à conduire les peuples enrichis: elles ont été refaites, élargies. Des

préoccupations d'un autre ordre ont hanté l'esprit des hommes d'Etat: il a fallu faire face à la réalité et suivre la marche des événements, grouper les initiatives, faciliter les tâches, protéger la richesse accumulée prévoir les insuccès. La politique est devenue "économique et sociale." Telle, la politique de l'Angleterre, soucieuse avant tout de conserver son hégémonie commerciale; telle, la politique de la France, cherchant à reconstituer sa fortune par la protection de ses industries; telle enfin la politique des Etats-Unis passés au rang des "puissances mondiales." Politique économique que ce mouvement de colonisation intense qui a marqué la fin du XIX^e siècle; plus raisonné qu'aux XVI^e et XVII^e siècles, et qui a donné lieu aux conceptions impérialistes. Partout, les intérêts économiques ont pris la première place. On les a défendus au prix des plus grands sacrifices. Ils sont au fond de la plupart des guerres contemporaines: guerre hispano-américaine, guerre du Transvaal, guerre russo-japonaise, guerre européenne de 1914. Ecoutons Ferdinand Brunetière: "Je dirais aujourd'hui, volontiers, que la cause des grandes guerres est et sera longtemps économique, et je ne dirais rien de si ridicule, ni même rien de si difficile à prouver." Nous citons à dessein des littérateurs: ils ne sont pas de la partie, mais ils l'observent, curieux, avertis, spectateurs intéressés au moindre signe. Et ils ne parlent pas autrement que feraient les économistes.

Voilà ce qu'on voit du dehors: pénétrons à l'intérieur de l'édifice. Il y a des lézardes sur les murs. L'armature d'or s'ébranle, secouée par des clameurs de révolte. Rien n'arrête la force qui monte des profondeurs du peuple: faisceau d'énergies obscures et innombrables auxquelles le suffrage donne une volonté commune, une action souveraine, le droit de commander. L'Etat, chargé de tous les soins et de tous les maux, s'efforce à distribuer la richesse par l'impôt qui redouble et par la création d'institutions de secours. La charité officielle s'organise, souvent impuissante. La législation apporte aussi des remèdes: elle subit l'influence des faits et des idées; d'individualiste qu'elle était, elle devient sociale. Les budgets, alourdis déjà par les dépenses d'un étatisme coûteux, supportent encore le faix des armements, les charges des guerres à venir, des terribles guerres présentes. Faut-il donc désespérer; et la situation ne laisse-t-elle plus d'espoir que dans un cataclysme final, semeur de ruines? Non certes! Si le progrès fut rapide, l'adaptation reste lente. Et c'est précisément le rôle de la politique intérieure de maintenir le progrès et d'assurer l'adaptation, de trouver la formule de justice et d'apaisement, d'harmonie et de paix, qui ne rebute pas l'effort légitime et fécond, et qui apporte aux "misères imméritées" une compensation humaine.

Sommes-nous si loin de tout cela que nous puissions fermer les yeux sans craindre une destinée semblable ? Peuple jeune, venu plus tard à la vie économique, n'est-ce pas là notre héritage ? Regardons mieux les symptômes qui se dessinent chez nous. Nous avons naguère pour mot d'ordre : "Emparons-nous du sol !" Ce programme a été dépassé sans être totalement rempli. Autrefois nous vivions heureux, près de la bonne terre, la plus sûre, la plus impassible de nos résistances ; et il est à espérer que nous y retournions un jour puiser un regain de vitalité. Mais ce temps n'est plus. L'industrialisme nous a gagnés. Nous voulons grandir, atteindre jusque là où l'ancêtre a touché. Le même aiguillon nous harcèle ; et nous rêvons richesse à notre tour. Tant mieux. N'en soyons pas chagrins. L'action est saine, et le désir de progresser est naturel. La fortune impose aux autres le respect. C'est une arme dont on nous menace volontiers, non sans quelque morgue : sachons en forger une qui vaille, en éclat et en finesse, celle qu'on nous oppose. Elle est aussi la source nécessaire du développement intellectuel et artistique ; tôt ou tard, elle nous donnera la pensée. Ne nous berçons pas néanmoins d'illusions vaines. Rien ne s'acquiert qui ne soit payé en retour de quelque façon. Toute puissance coûte cher, et souvent elle s'écroule sous son propre poids. Ne nous flattons pas d'échapper aux conséquences que l'industrialisme a entraînées ailleurs, et qui sont comme la rançon fatale de ses bienfaits. Déjà nous sentions les premiers malaises d'un régime à peine implanté. Que sera-ce demain, au sortir des cruautés de cette guerre, alors que notre économie nationale sera bouleversée ? Nous devrons non seulement parer au plus pressé, refaire les brèches, reconstituer nos forces ; mais, encore et surtout, nous préparer à la lutte économique qui suivra la paix, utiliser l'expérience acquise, assurer nos positions, ramener la confiance, nous élancer vers l'avenir. Plus heureux que d'autres, nous avons sous les yeux les leçons de l'histoire contemporaine. Pour éviter les erreurs où les peuples ont glissé, pour exploiter méthodiquement notre patrimoine, écarter les maux dont les sociétés plus anciennes ont souffert, nous n'avons qu'à regarder et apprendre : la vieille Europe a vécu pour nous. L'avenir, le pensez-y bien de chaque heure, de chaque minute ! Qui de nous refuserait de s'y consacrer tout entier, si le salut immédiat de la nation était en jeu ? N'est-ce pas pourtant un peu cela ? Réfléchissons. Le triomphe des autres sera d'autant plus facile qu'ils nous trouveront désarmés devant le sort, le sort qu'ils nous imposeront. Pourquoi refuserions-nous plus longtemps de nous livrer à l'étude des problèmes économiques si la nécessité pressante, plus encore, si le devoir de l'heure nous l'ordonne ? Pourquoi ne demanderions-nous pas à la Science économique de satisfaire nos curiosités ; de secouer nos indolen-

ces; de nous donner la culture générale qui nous manque, les connaissances spéciales qui nous permettront de mener à bien notre tâche ordinaire; de nous fournir enfin, à bien bon compte, un moyen sûr, éprouvé déjà plusieurs fois, de servir notre pays quelle que soit la sphère où s'exercent nos activités, où rayonne notre influence? Un tel profit vaut, certes, que l'on se donne un peu de peine.

Pour nos industriels et nos commerçants, cela paraît évident. Ils sont du mouvement; ils en vivent. Il ne leur suffira pas cependant de savoir calculer un prix de revient, vérifier une comptabilité, clore un inventaire. Leur entreprise, si peu considérable soit-elle, offre à l'observateur des aspects variés, instructifs. Qu'ils sortent de leurs bureaux, qu'ils laissent un instant leurs livres, pour regarder cette large vie dont ils sont une parcelle, qui bouillonne autour d'eux. Sans aucun doute, leur connaissance des affaires et leur honnêteté sont de précieux apports dont la collectivité bénéficie; mais on est en droit d'exiger d'eux davantage encore. Nul effort qui soit inutile; nulle bonne volonté qui ne porte des fruits. Le succès de tous dépend des énergies individuelles qu'il synthétise. Nous disons volontiers qu'il nous reste beaucoup à faire: c'est une piètre consolation que de le constater, sans plus. Agissons. Notre commerce est-il sérieusement organisé? Avons-nous notre part dans le total des tractations journalières, annuelles? Nous sommes-nous "emparés de l'industrie?" Notre finance a-t-elle un plan d'action bien défini? est-elle hésitante, timide, craintive? Donnons-nous pleine satisfaction à ceux qui se font un devoir de nous encourager? Nous aidons-nous seulement les uns les autres; et ne sacrifions-nous pas à un égoïsme funeste, chronique, à un besoin de dénigrement où s'épuise notre esprit en pure perte, où s'assèche notre cœur? Si tout est à refaire, recommençons! Si les guides nous manquent et si les organes font défaut, sachons créer des autorités et susciter des initiatives. Ce n'est pas tout. Au sortir de l'usine et de la boutique, il y a le vaste domaine politique où trop peu de nos hommes d'affaires s'aventurent. Qui donc pourrait mieux contribuer au relèvement de nos finances si misérables en certains quartiers, à l'administration de notre fortune nationale, si souvent menacée? C'est le fait de l'apathie générale, de la routine satisfaite. C'est aussi que nous manquons d'hommes alliant à la volonté une culture suffisante. Ces défauts peuvent s'atténuer, cette pénurie peut disparaître. Travaillons.

Frédéric LePlay a classé les professions libérales "selon la résistance à la corruption." Il mentionne, en tout premier lieu, les ingénieurs. Il écrit, dans sa *Réforme sociale en France*:¹ "Je place d'abord ici, pour ordre, et sans qu'il soit besoin d'une justification

¹ 2e volume, pp. 191-192.

spéciale, un groupe nombreux de personnes établissant la transition des arts usuels aux arts libéraux: je veux parler des ingénieurs et des architectes, qui, s'inspirant de la science ou de l'art, dirigent, avec un caractère privé, les constructions et les travaux réclamés par les particuliers et par l'Etat. Ce sont, à vrai dire, des chefs d'industrie, et, comme ceux-ci, ils ne prospèrent que par l'ordre et le travail. La concurrence fait bientôt justice de ceux qui manquent à leur devoir: elle punit immédiatement la paresse et les autres vices dont pourrait souffrir le public." De tous les producteurs, l'ingénieur est celui qui donne le plus parfaitement l'impression de créer quelque chose. C'est une force dirigeante; un admirable metteur en oeuvre, que stimulent de lourdes responsabilités et le souci constant d'améliorer. Il conçoit et il exécute. Il donne d'abord à ses ouvrages la forme solide d'une mathématique précise et savante; puis, les ayant ainsi schématisés, il les projette dans la réalité, où ils servent à l'usage commun, où ils demeurent comme l'attestation sensible de son génie. Il est, à la fois, industriel et artiste, patron et ouvrier, quand il n'est pas également financier: c'est un praticien. A ces titres, l'Economique ne peut que lui servir. Elle ne lui suggérera peut-être rien qu'il ne sache déjà sur son art difficile; mais elle lui apportera des clartés qui lui feront apercevoir, comme dans un prolongement, les conséquences de son travail d'exécution. Agent lui-même de production, n'est-il pas bon qu'il connaisse les causes de la productivité du travail et les avantages de la division des tâches; les formes et les caractères des capitaux publics et privées, fixes et circulants; les facilités que le crédit accorde; les modes de répartition des revenus? Esprit merveilleusement préparé à l'étude de ces questions, qui sont connexes à ses entreprises, nous n'en connaissons pas qui soit plus apte à dégager des phénomènes nombreux et quotidiens, qui sont dûs à son action directe, la loi qui les domine, le principe qui les explique.

S'il s'occupe des transports, il ne fera pas porter son attention uniquement sur le fait physique de la construction, sur l'ensemble des conditions techniques de la mise en place. Il doit être en mesure d'apprécier les résultats économiques des travaux qu'il a accepté de faire, qu'il dirige, qu'il a peut-être proposés. Pour cela, il a dû compiler des statistiques, établir les aléas du trafic, étudier les ressources du pays à traverser en ne perdant pas de vue le taux normal de la tarification et la quotité de l'impôt, tenir compte de la concurrence des compagnies d'exploitation rivales, supputer le rendement probable des premières années, prévoir les bénéfices ultérieurs suivant un calcul de base qui soit acceptable.¹ S'il entre à l'usine, ou même si—pionnier

¹ Voir le *Cours d'Economie politique*, professé à l'Ecole nationale des Ponts et Chaussées, par M. C. Colson, ingénieur. Ce cours est divisé en six livres; le sixième

du progrès—son art le conduit dans quelque région réculée, il ne se désintéressera pas du sort des ouvriers, de “ses hommes” comme on dit couramment, des conditions générales du travail, de la sécurité des ateliers et des chantiers. Nos idées individualistes nous empêchent de priser beaucoup l’ingérance de l’Etat dans le domaine de l’industrie privée. Mais des mots nouveaux sont apparus dans les programmes de nos partis politiques: nous aurons peut-être à créer, avant longtemps, tout un système d’assurances sociales, d’œuvres patronales. Plus tard cela viendra, mieux cela vaudra, c’est entendu; néanmoins, il faut prévoir le moment où l’ingénieur, suivant l’expression d’Emile Cheysson, devra, sans abandonner la technique, faire oeuvre sociale, “c’est-à-dire, joindre à de fortes connaissances professionnelles celles qui concernent les institutions destinées à asseoir la prospérité de l’entreprise sur le bien-être des ouvriers qu’elle emploie.”¹ Enfin, chaque jour, l’ingénieur rédige des rapports. Il peut se borner à des indications purement pratiques; mais il voudra, pour faire saisir l’ensemble du sujet qu’il traite, joindre aux données de métier des considérations d’un ordre plus étendu. Il peut même arriver qu’il y soit contraint par la nature des opinions qu’il formule et que, pour ne citer qu’un exemple, il soit amené à déterminer, d’après des recherches sérieuses, la valeur d’une entreprise; et l’on sait de reste ce que ce terme *valeur* est par lui-même abstrait, et combien il y entre d’éléments souvent contradictoires, parfois douteux, sinon obscurs. L’Economie politique lui prêtera sa lanterne, que dis-je? son flambeau!

Et l’avocat? Quels avantages peut-il attendre de la science des intérêts matériels? Dans un discours admirable qu’il prononçait, en 1906, à la Chambre des Députés, M. Paul Deschanel faisait allusion “à une justice nouvelle, la justice économique.”² De fait, l’évolution industrielle a ébranlé les anciennes assises du droit qui est, le plus souvent, la consécration officielle et uniforme d’une réalité sociale. La loi reconnaît ce qui est et l’impose; elle s’adapte à quelque chose d’antérieur à elle-même; elle définit étroitement la coutume et l’enferme dans un texte.³ C’est ainsi que, sous l’influence

est consacré aux travaux publics et aux transports et se vend séparément (Paris, Alcan, 6 fr).

¹ *Oeuvres choisies*, 2e vol., p. 33, sous ce titre: “*Le Rôle social de l’Ingénieur*,” conférence faite devant la Société des Ingénieurs civils de France. Voir l’ouvrage de M. William H. Tolman: *L’Ingénieur social*, Paris, Vuibert et Nony.

² Paul Deschanel: *L’Organisation de la Démocratie*, p. 31.

³ “Trois phases se succèdent dans la genèse d’un droit: 1° la coutume, 2° la jurisprudence, 3° la loi. Le législateur ne saurait intervenir utilement que dans la dernière de ces phases. La loi doit se borner, le plus souvent, à codifier la coutume. . . . (qui) résulte des nécessités sociales, industrielles, économiques de chaque jour. La jurisprudence les fixe. La loi les sanctionne.” Gustave Le Bon, *Psychologie politique*, p. 45.

de certains événements, l'ancien principe de la liberté de chacun a, sur quelques points, cédé devant le principe du bien de tous et de la solidarité.¹ Le législateur a dû se préoccuper du sort des humbles, des dépourvus. Il les a protégés. Il a exigé des patrons qu'ils prennent dans leurs usines des mesures d'hygiène; il a veillé sur l'ouvrier en réglementant l'atelier et en limitant la durée du travail; il a corrigé ce que pouvait avoir d'injuste le libre jeu de l'offre et de la demande en fixant un minimum de salaire dont il a, par surcroît, garanti la disposition au travailleur en restreignant le droit de saisie. Le contrat, source des obligations, a été interprété dans un sens plus large, en tenant compte de ses conséquences sociales. Une doctrine—non pas nouvelle, il est vrai, mais renouvelée—s'est dessinée et affirmée, celle de l'abus du droit: elle interdit aux contractants, qui voudraient se prévaloir uniquement de leurs avantages, de rompre une convention sans se soucier des dommages que cette rupture, future légale, entraînerait. Ainsi se constitue, par approches, la législation dite *industrielle*, dont certaines dispositions ont attiré l'attention des diplomates et ont trouvé une expression plus solennelle, et une portée plus étendue, dans des conventions internationales. Or, les arguments de l'avocat seront d'autant plus précis, plus éclairés, plus convaincants, plus émouvants, qu'il les aura tirés des faits et des circonstances, de la substance réelle ramassée dans la lettre de la loi. Si la coutume détermine la jurisprudence et si la jurisprudence, en se solidifiant, finit par provoquer la loi, l'avocat devra découvrir les sources vives de cette coutume et savoir comment elle se forme, comment elle se cristallise autour de lui, pour collaborer avec elle et, par son effort personnel, la faire passer dans la jurisprudence, être un véritable législateur, un créateur de justice, en restant un observateur ouvert, attentif—et nous dirions volontiers: attendri—de la réalité.

Il en va de même des législations qui ont un caractère encore plus rigoureux: la législation commerciale, par exemple. Les modalités et les conditions essentielles du contrat de change sont arrêtées par

¹ Cf. Une étude de M. A. Crétinon: *Droit individualiste et Droit social*, Comptendu de la *Semaine sociale* de Bordeaux (1909) pp. 127 et suiv: "La formule individualiste, que le législateur n'a pas adoptée, mais que quelques-uns lisent entre ses lignes, serait celle-ci: d'une part, pas d'obligation sans contrat; d'autre part, tout engagement contractuel est licite. . . . La correction inspirée par le sens social consiste, au contraire, en ces deux propositions: le citoyen peut être astreint par la loi à des obligations qu'il n'a pas consenties. A l'inverse, la loi se refuse à sanctionner certains engagements contractés par lui. L'intérêt des autres, de la société, inspire dans le premier cas cet ordre, dans le second, cette défense."—Voir sur cette intéressante question de l'évolution du droit l'ouvrage de M. Léon Duguit; *Les Transformations générales du Droit privé depuis le Code Napoléon*, et particulièrement le chapitre V, consacré au contrat.

une loi fédérale, la loi "des lettres de change." Elle est excessivement compliquée, rédigée sans aucune espèce de respect de ce qui s'appelle méthode et clarté. C'est un fouillis. Il est à peu près impossible de posséder cette loi, si l'on n'en a pas fait une étude approfondie et répétée, à la lumière de la pratique courante des opérations de change. Et cela ne suffit pas. Pour comprendre ces dispositions, tout d'abord déconcertantes, il faut avoir appris les principes économiques qu'elles ont mission de sauvegarder et les éléments de la circulation des richesses que nous définissons plus haut. Des étudiants arrivent à l'Université qui ne savent pas ce que c'est qu'un chèque. Allez donc leur confier le texte de la loi sur les lettres de change? Ils n'y verront goutte. Au contraire, mettez-les peu à peu au courant des transactions commerciales, du mécanisme de l'achat-vente, de la nécessité et du rôle du crédit, des détails en apparence insignifiants de la vie économique et, en leur révélant le monde des affaires, vous les préparerez à saisir le sens exact et la raison prudente des articles de la loi.

Qu'est-ce à dire sinon que l'avocat ne doit pas s'en tenir uniquement à des textes ni se laisser fasciner par eux. Il doit chercher dans les origines de la loi, dans son application immédiate, et aussi dans les conséquences qu'elle peut avoir si on ne sait pas lui donner son sens plein, les motifs d'une interprétation nouvelle, moins étroite, plus conforme aux données de l'expérience et aux commandements de la vraie justice. Sous la rigidité de ces textes, il découvrira ainsi la vie du droit, et ce qui en détermine la lente évolution à mesure que les événements économiques et sociaux se coordonnent.¹ On connaît ces pages du *Carnet d'un Stagiaire* que M. Henry Bordeaux a intitulées: *La dernière Leçon de Droit*. Maître Rameau conduit le futur romancier sur une hauteur qui domine la ville. Le poète se perd volontiers dans les lointains et ses yeux cherchent, vers les limites imprécises et plus vaporeuses de l'horizon, l'âme de toutes ces choses qui vont se reposer dans le soir. Regardez plus près de vous, lui dit doucement le vieil avocat, voyez ces paysans au labour et comprenez la leçon qu'ils nous donnent. "Un Maistre, un Bonald, un LePlay, un Fustel de Coulanges — tous ceux-là dont vous avez vu les ouvrages au premier rang dans ma bibliothèque, et reliés plus précieusement que les recueils de jurisprudence, — ont connu et aimé la terre. Ils n'ont pas cessé de penser à elle. Ils ont raisonné sur des réalités, non point sur des

¹ "Ce seront toujours les formules juridiques qui devront, en définitive, se ployer et s'adapter aux nécessités de la vie et à l'impérieux déterminisme des faits, bien loin que ceux-ci se doivent soumettre aux déformations que leur voudraient faire subir les docteurs pour pouvoir les faire entrer dans les cadres tout préparés de leurs constructions rigides et symétriques." A. Boissard, *Contrat de Travail et Salarial*, p. 187.

livres ou des leçons d'écoles. C'est pourquoi il n'y a point chez eux de vagues abstractions, ni de fausse sensiblerie. Mettez des figures sur les dossiers, sur les chiffres, sur les mots, sur les idées. Ce partage de succession, que vous étudiez tout à l'heure quand je vous ai enlevé, c'est le patrimoine fondé par un homme, maintenu ou agrandi par une série de générations, émietté systématiquement entre les enfants. Un domaine qui a vécu, une famille qui se divise, ce sont aussi des romans ou des tragédies."¹

J'admire, disait récemment un avocat, que, pour faire appliquer la loi, il faille connaître le droit et que, pour l'élaborer, cela ne soit plus requis. Il y a du vrai; mais la tâche du député-législateur est déjà suffisamment complexe. Quel homme embesogné! On lui demande de tout savoir, ou guère moins; d'être de tous les métiers et du sien propre, tour à tour cultivateur, industriel, négociant, avocat, médecin, voire humaniste et poète, quand les années sont bonnes; d'être tous ces hommes ou de les comprendre tous, ce qui revient à peu près au même; de savoir les mille besoins d'un pays, quand cela est déjà considérable d'en connaître un seul et d'y satisfaire à peu près. A ceux-là qui sont appelés à exercer un pareil empire et à conduire autant de destinées, l'Economie politique apportera une méthode, et davantage. Elle leur révélera les aspects, parfois déconcertants, de la vie matérielle de la nation, ses difficultés, ses soubresauts, les dangers qui la menacent, les maux qui pourraient l'atteindre. Elle est une science d'analyse et une science sociale: elle décompose les éléments dont la somme explique les activités heureuses d'un pays. Celui-là eut raison qui la définit un jour: la science ménagère des peuples. Elle enseigne comment garder la maison commune,—et c'est déjà quelque chose, si modeste que cela paraisse.

Voilà pourquoi cette science est utile et actuelle, et pourquoi elle devrait être plus répandue. Commencez par éclairer le suffrage populaire, disent ceux qui demeurent suffisamment optimistes pour admettre que le suffrage populaire puisse être éclairé. C'est fort bien; mais a-t-on pensé aux moyens de l'instruire et de le guider? Ce ne sera pas, j'imagine,—ou du moins ce ne sera pas absolument—en lui inculquant les hautes mathématiques, ni l'astronomie. C'est beaucoup plus simple, en vérité. Le suffrage, exercice d'un droit politique, réclame un enseignement qui soit de nature politique. Apprenons au peuple ce que c'est qu'un gouvernement, quels sont les origines historiques et les principes premiers de la constitution, quelles sont les lois fondamentales de l'économie nationale. Appre-

¹ Henry Bordeaux: *Carnet d'un Stagiaire*, pp. 361 et suiv.

nons-lui à gouverner, puisque, aussi bien, c'est à lui que revient cet honneur; et ne permettons pas qu'un jeune homme atteigne l'âge de voter, sans qu'il ait compris l'importance et le poids de l'acte qu'il pose. Ne nous laissons pas de relire, à ce propos, la belle préface des *Origines de la France contemporaine*, dont il serait plaisant de rapprocher telle page d'une conférence de M. Aulard.¹ "En 1849, écrit Hippolyte Taine, ayant vingt et un ans, j'étais électeur et fort embarrassé, car j'avais à nommer quinze ou vingt députés, et de plus, selon l'usage français, je devais non seulement choisir des hommes, mais opter entre des théories. On me proposait d'être royaliste ou républicain, démocrate ou conservateur, socialiste ou bonapartiste; je n'étais rien de tout cela, ni même rien du tout, et parfois j'enviais tant de gens convaincus qui avaient le bonheur d'être quelque chose. Après avoir écouté les diverses doctrines, je reconnus qu'il y avait sans doute une lacune dans mon esprit. Des motifs valables pour d'autres ne l'étaient pas pour moi; je ne pouvais comprendre qu'en politique on put se décider d'après ses préférences" Et s'il n'y avait que le suffrage, mais l'individu, quelle que soit sa situation, exerce une action sociale. Comment veut-on qu'il s'y prenne, s'il n'a pas appris; s'il n'apprécie même pas sa propre valeur; s'il vit isolé dans l'ignorance absolue de ses devoirs et dans la satisfaction unique de son égoïsme? Pourra-t-il se soustraire aussi facilement aux responsabilités de son état et arrêter les répercussions fatales, et souvent irréparables, de ses actes? Ainsi, et par quelque chemin que nous prenions, nous revenons toujours au même point: le peuple, la nation, la maison commune.

CONCLUSION.

Celui qui écrira la philosophie de notre histoire y verra trois étapes nettement tranchées et que caractérisent, de notre part, des attitudes différentes. Nous avons lutté,—ce fut là notre sort constant—mais avec des armes qui ne furent par toujours les mêmes. Nous avons lutté d'abord sur le champ de bataille pour que la France conservât sur cette terre son empire et ses droits. Nous avons lutté ensuite à la tribune, trouvant dans la Constitution anglaise la revanche

¹ M. Aulard disait naguère aux étudiants républicains: "Je me rappellerai toujours l'angoisse que me causa mon premier vote. Deux candidats républicains étaient en présence; l'un demandait deux Chambres, l'autre n'en voulait qu'une; celui-là déclarait la République perdue si l'opinion de son concurrent l'emportait; celui-ci disait exactement la même chose; ils n'étaient d'accord qu'en cela. Étais-je, moi, pour les deux Chambres ou pour la Chambre unique? Je ne savais pas, je n'y avais jamais pensé. . . . Un des deux candidats avait une tête de brave homme. Je votai pour lui sur sa mine, je me mis à étudier l'histoire de la démocratie."

inattendue de nos défaites passées. Aujourd'hui, le terrain où se continue notre effort a changé d'aspect. La lutte est devenue pratique, intéressée; elle est plus terre à terre, mais non moins périlleuse. Elle est emportée, rapide. Elle a quitté le domaine du droit et des libertés nécessaires pour descendre sur celui, beaucoup plus aride, des affaires: elle est devenue économique. C'est la pensée dirigeante du livre si substantiel de M. Errol Bouchette, qui porte un titre d'allure prophétique: *L'Indépendance économique du Canada français*. "L'esprit envahisseur moderne, écrit cet auteur, cette manifestation sociale qu'on voudrait confondre avec le patriotisme, est né de l'industrialisme débordant qui s'est emparé des vieilles civilisations. Or, comme il faut combattre avec les armes de son siècle, c'est aussi par l'expansion industrielle, tant manufacturière qu'agricole, que les peuples situés comme nous le sommes, qui possèdent de vastes territoires qu'ils peuvent difficilement défendre par les armes, échapperont peut-être à la conquête. Il reste donc acquis que, si nous voulons accomplir nos destinées, il nous faut chercher, pour les appliquer à notre pays, les meilleures solutions industrielles et sociales."¹

C'est là ce qui formera la noyau de notre politique prochaine et qu'il faudra bien que nous formulions un jour, puisque déjà nous en sentons obscurément la pressante nécessité. Car une société qui veut agir doit obéir à une discipline; une minorité doit avoir une doctrine précise, qui indique avec sûreté la direction où elle engagera ses activités. Cette doctrine sera conforme à nos origines, respectueuse de notre lignée française; elle prendra son point d'appui et ses attaches dans nos traditions nationales, sources de notre vie comme peuple et seule raison d'être de nos résistances. Pour citer de nouveau M. Taine, "l'histoire a décidé pour nous," et, puisque nous avons naguère choisi d'exister, nous devons rester, coûte que coûte, dans la logique de notre passé. La question est de savoir comment nous y parviendrons, et si nous négligerons volontairement de faire servir au triomphe de notre race les moyens nouveaux et singulièrement puissants qu'une civilisation plus développée nous apporte. Un peuple, c'est sans doute une pensée commune, mais c'est aussi une énergie collective. M. Emile Boutroux, dans la magnifique conférence qu'il a prononcée, en novembre

¹ *L'Indépendance économique*, 3ème édition, p. 19. M. Bouchette écrit encore: "L'harmonie qui doit régner entre (les deux races) n'est pas, comme on le croit souvent, entièrement une affaire de sentiment. On ne l'obtiendra jamais *en méconnaissant les aspirations légitimes et en étouffant la vitalité d'une partie de la population*. Cette harmonie ne dépend pas non plus uniquement ni principalement du bon sens des individus qui composent ces races. La bonne volonté, de part et d'autre, peut contribuer puissamment au résultat désiré, mais le principal, le vrai facteur, c'est la condition économique de chacune." Op. cit., p. 17.

1912, sous les auspices du Comité France-Amérique, distingue, d'après un penseur américain, trois philosophies dont l'une, le matérialisme, est un arrêt de la volonté dans la matière universellement inerte; dont l'autre, l'évolutionnisme, est l'expression d'une force fatale qui entraîne vers l'avenir l'humanité soumise et docile; dont la troisième enfin est un mélange d'idéalisme et de conscience. "L'homme, d'après cette manière de voir, ne s'adapte pas seulement à son milieu, il adapte son milieu à ses volontés, il change la face de la terre, il crée, il se crée."¹ Est-ce trop présumer que de reconnaître, dans cette philosophie raisonnée de l'action, le principe fécond de notre conduite future? Et si cette action doit être économique, si elle doit nous porter du côté des intérêts matériels—garantie de notre vie intellectuelle de demain—n'est-ce pas précisément dans la science économique qu'il convient de chercher, au premier chef, les moyens actuels d'assurer notre survivance?

¹ Emile Boutroux: *La Pensée américaine et la Pensée française*. Cette conférence a été publiée dans la *Revue France-Amérique*, livraison de janvier 1913.



Joseph Howe

Transactions of The Royal Society of Canada

SECTION II

 SERIES III

MARCH 1917

 VOL. X

Joseph Howe and the Anti-Confederation League.

EDITED WITH INTRODUCTION, NOTES AND BIBLIOGRAPHY BY
LAWRENCE J. BURPEE.

INTRODUCTION.

Shortly before his death Sir Robert Weatherbe wrote the present writer that he had in his possession a series of letters addressed by Joseph Howe to William J. Stairs, relating to the Anti-Confederation Movement. He thought of editing these letters, and asked advice as to the most suitable means of publication. It was suggested that they might be submitted as a paper to The Royal Society, and published in the Transactions. Unfortunately Sir Robert Weatherbe did not live to carry out his idea. As one who had been Joint Secretary of the League of the Maritime Provinces, of which Howe was President and Stairs one of the Vice-Presidents, and who had been on terms of intimacy with all the principal actors in the Anti-Confederation Movement, he would have been an ideal editor of such a series of letters. The present writer, with Lady Weatherbe's consent, undertook the task. Although conscious enough that at best he could offer only a very poor substitute for the paper Sir Robert Weatherbe would have produced, he felt that these letters of Joseph Howe were too important to remain in obscurity, particularly at a time when Canadians were preparing to celebrate the fiftieth anniversary of the birth of the Dominion. In the notes appended to the letters an effort has been made to identify names and incidents that were more familiar to Howe's contemporaries than they are to Canadians of the present generation.

So far as the life of Joseph Howe is concerned, nothing need be said here that does not relate to his connection with the movement in Nova Scotia to defeat the Confederation project, at least so far as that province was concerned. Nothing approaching a complete biography of the great Nova Scotian has yet been written; but the main facts of his life, and at least some ideas as to his complex character, may be

gleaned from the biographical sketches written by the late Principal Grant, his son William Lawson Grant, and J. W. Longley, and from the *Speeches and Public Letters of Joseph Howe* edited by William Anand in 1858, and republished with many additions under the editorship of J. A. Chisholm in 1909.

Howe was over sixty years of age when he accepted the leadership of the party in Nova Scotia organized to fight Confederation. His motives in taking such a step at first seem inexplicable. In 1849, in 1861, and even in 1864, he had supported with all his fiery eloquence the principle of Confederation. He was still an advocate of Maritime union, and of Imperial union—and yet in 1865 we find him waging a furious battle against the union of all the British North American colonies, or at any rate against any such union as was proposed by the Quebec Conference. The objections he professed to find on public grounds to the terms of the Quebec Resolutions are sufficiently set forth in these letters to Stairs, and in his published Speeches. But no careful student of the character of Joseph Howe can avoid the conclusion that there were personal as well as public reasons for his extraordinary change of front. Howe was a man of brilliant parts, one of the few really great public speakers that British America has produced, and a born leader of men. He was a man of generous sympathies, a delightful companion, and a warm friend—as long as he was allowed to have things his own way. There lies the key to the puzzle. Howe was a supreme egoist. He had unlimited faith in his own judgment, and would brook no opposition. He would put every ounce of strength into a fight, if his place was at the front. He was content that anyone else should have the tangible rewards, but his must be the glory. He was a splendid captain, but an utterly impossible lieutenant.

Unfortunately circumstances made it difficult or impossible for him to attend either the Charlottetown Conference or the Quebec Conference. Had he been there he would probably have thrown himself heart and soul into the Confederation project. But he was not there, and in his place sat his one great rival in Nova Scotian politics, Charles Tupper. The scheme of Confederation probably owed more to the shrewd common sense, political sagacity and indomitable courage of Charles Tupper than to the qualities of any other of its fathers. So far at least as Nova Scotia was concerned, Tupper was the very embodiment of the movement. There remained in 1865 only one place in that movement for Howe, and that place he would rather perish than accept. In his own forcible language, he would “not play second fiddle to that damned Tupper.” But if he could not lead the forces of Confederation, and would not follow Tupper, there was still

room for a brilliant and resourceful general in the army opposed to Confederation. With characteristic energy and convincing eloquence he threw himself into the fight, and might in the end have defeated the cause of union had there not been opposed to him an overwhelming body of public opinion, or at any rate of the leaders of public opinion, on both sides of the Atlantic, determined to unite the scattered colonies of British North America.

The League of the Maritime Provinces was organized at Halifax in the summer of 1866. The name is something of a misnomer, as the membership of the League was confined to Nova Scotia, and largely to Halifax. The Constitution is interesting as setting forth the grounds of opposition to Confederation. Its language suggests pretty conclusively that it was the work of Joseph Howe. The text will be found in the Appendix.

Joseph Howe, Hugh McDonald and William Annand were appointed delegates of the League, to oppose in England the passage of the Imperial statute sanctioning the proposed union of the Colonies. Howe and Annand sailed early in July. McDonald followed later. The Confederation delegates from Nova Scotia and New Brunswick reached London about the end of July. Their colleagues from Canada did not, however, arrive until the middle of November. Howe therefore had at least five months in which to work up public sentiment in England against the union, and he used his opportunity to the best possible advantage, as his letters show. Annand seconded his efforts in every way, and when McDonald arrived he too threw himself into the fight. Their principal opponents were Tupper and Jonathan McCully of the Nova Scotia delegation, and before long most of the great London and provincial newspapers were drawn into the controversy on one side or the other. In September Howe issued a pamphlet on "Confederation considered in relation to the Interests of the Empire." Tupper published a reply in which with telling effect he set Howe against Howe, quoting passage after passage from speeches in which Howe had urged the advantages of Confederation. Annand replied to Tupper's pamphlet, McCully did his best to demolish Annand's arguments, and McDonald attacked McCully. So the war of words went merrily forward, no doubt to the edification of the small group of Englishmen who at that time were mildly interested in the affairs of the Colonies.

The delegates of the League remained in England until April, 1867, when, having fought Confederation to the last ditch, and lost the battle, they returned to Halifax. The British North America Act had been finally passed on the 29th March.

THE ROYAL SOCIETY OF CANADA

Howe was too shrewd a politician to have harbored any very great hopes of defeating the Confederation bill, after he had had an opportunity of studying the situation in England. Nevertheless he fought it with undiminished energy to the end. Confederation being then an accomplished fact, no one could fairly blame him if he decided to accept gracefully the situation. Howe, however, was essentially a fighter. He had no sooner returned to Nova Scotia than he threw himself into the local campaign to defeat Tupper and the Confederate party in Nova Scotia. The elections were held in September, and the Anti-Confederates swept the province, carrying thirty-six of the thirty-eight seats. In the elections for the new Dominion Parliament, eighteen out of nineteen constituencies returned Anti-Confederates. Howe carried Hants by an overwhelming majority, and led his almost solid phalanx of Anti-Confederates to Ottawa. The only fly in his ointment was the fact that his old enemy Tupper had been re-elected in Cumberland.

The opponents of Confederation having captured Nova Scotia, decided to agitate for a repeal of the British North America Act so far as their province was concerned. An address was adopted by the Assembly praying His Majesty to grant repeal; and at a public meeting held in Temperance Hall, Halifax, on January 13th, 1868, the following Resolutions were adopted:

“Whereas, owing to the great diversity of interests and feeling between the Provinces of Nova Scotia and Canada, the public sentiment of the people of Nova Scotia is distinctly opposed to the Confederation of this Province with the Province of Canada.

And whereas, the people of Nova Scotia never did become assenting parties to the Act of Union, the Legislature which sanctioned such Act having done so in direct opposition to the well understood wishes of the People, and by assuming a power never entrusted to them.

Therefore *Resolved* That in the opinion of this meeting the Act of Union, as passed and made law by the Imperial Parliament, has no claims upon the Loyalty of the People of Nova Scotia, any obedience yielded to such Act, being a matter of coercion and not given with the free assent of a free people.

And be it also *Resolved* That this meeting hails with much satisfaction the action of the members of the Nova Scotia Legislature and also of the Nova Scotia Members of the Dominion House of Commons who have signified their determination to use all constitutional means to bring about a Repeal of so much of the Act of Union as refers to the Province of Nova Scotia—and also express the hope that the Legislature of this Province immediately after assembling for despatch

of business will take the necessary steps to bring this subject before the government and Parliament of Great Britain."

Joseph Howe, William Annand, Jared C. Troop and W. H. Smith were appointed delegates, to bring the views of the repealers to the attention of the British Government. Howe sailed for England on February 14th, and the others followed later. Tupper was sent over by the Dominion Government to oppose the movement for repeal. Howe used all his tact and powers of persuasion to secure the release of his province, but without avail. In a despatch dated June 4th, 1868, from the Duke of Buckingham to Lord Monck, Governor General of Canada, the Colonial Minister says that he has had an interview with the delegates, and has laid before the Queen the address of the House of Assembly of Nova Scotia praying for repeal. He discusses at some length the complaints of Nova Scotia that no appeal had been made to the people, and that the union had not been made subject to ratification by the provincial legislatures, and announces the decision of the Imperial Government that under all the circumstances it would not be warranted in advising the reversal of a measure not merely conducive to the strength and welfare of the Province but also important to the interests of the whole Empire.*

In London, Tupper, foreseeing the failure of Howe's mission, determined to win him if possible to the side of the Dominion. One gets interesting and rather amusing glimpses of the meetings between the two old political warriors, from both Tupper's and Howe's published correspondence.

Tupper writes Macdonald, April 9, 1868:†

"I called and left a card for Mr. Howe (who was not in) immediately after my arrival, and saw Annand and Smith, but made no reference to politics. Last Monday morning Howe came to see me here, and we spent two hours in the most friendly, I may say unreserved, discussion of the whole question. He met me with the observation that he would not say that he was glad to see me here, but that he expected me, as he knew that under the circumstances I must come. He said that if the Government and Parliament refused to do anything, he intended to tell the people of Nova Scotia that he was ready to adopt any course they might decide upon. I told him that I considered it due to my own character as a public man, as well as to the interests of my country, to obtain the approval of Nova Scotia to the union; that I had, after careful consideration, decided that it could be done despite all opposition, and had refused the chairmanship of the Railway Commission in order to leave myself untrammelled, and strengthen my hands for the work, but that I was tired of fighting, and knew the struggle would

*Campbell, *Nova Scotia*, 460-61.

† *Recollections of Sixty Years*, 73-4.

be most injurious to all concerned. I told him I expected him to do all in his power to obtain repeal, both with the Government and Parliament; but that in case he failed he must see that persisting in a course of antagonism to the Dominion and Imperial Governments would only end in the ruin of himself and his party, and be the cause of immense mischief to the country. I told him if, on the other hand, he went back to Nova Scotia and told them that before entering upon any further antagonism they had better give the union a fair trial, he would find the Government and Parliament of the Dominion not only ready to make any practical concession to the interests of Nova Scotia, but to give the public sentiment of the people, as expressed at the election, the fullest weight; that a seat in the Government and the position declined by myself would afford the means of doing justice to the claims of the Nova Scotia party; and that I would unite my fortunes with theirs and give them the most cordial support.

He appeared deeply impressed by my statements, and said a great many civil things, but expressed his fears that if he took that course his party would abandon him. I told him that between us we could rally to his support three-fourths of the wealth, education and influence of the country, and that I could assure him that he would thus entitle himself to the most favourable consideration of the Crown. The duke (Buckingham) has entered warmly into my views, and has invited Howe and myself to visit him at Stowe Park.

Howe suggested, although he said he could not propose it, that a Commission of three English gentlemen should be appointed to report upon Confederation for the information of Parliament, etc. This could, I think, only be done without compromising the Dominion by being suggested, or rather challenged, by the Canadian Government in answer to the attacks on it. The effect in case of a struggle, *i.e.*, if nothing can be done with Howe, would be to gain time and let us in N. S. down easily. I told Howe that, of course, I could not suggest it, and said it was, besides, open to the great objection that it would keep up agitation, and prevent him and his friends availing themselves of the present favourable opportunity of acquiring a position and influence to serve the province."

Howe's version of this interview is contained in a letter dated April 9th:*

"We were honoured by a visit from Tupper, immediately on his arrival in London. He never called last year. I returned his visit four or five days after, and had an hour's talk with him. . . . Of course he assumes that we will be beaten here, and is most anxious about what is to come after, and desirous that we shall *then* lay down our arms. He thinks the Canadians will offer us any terms, and that he and I combined might rule the Dominion. Of course I gave him no satisfaction."

Again on April 18th, Tupper writes Macdonald:†

"After a very pleasant visit at Stowe and the most friendly intercourse with Mr. and Mrs. Howe for three days, he and I had a long

* *Speeches and Public Letters*, 534.

† *Recollections of Sixty Years*, 80-1.

and confidential conversation the night before he left. He expressed again his fears that if he took the course I suggested he would be abandoned by the people and defeated, but I have pledged him, in case he takes the patriotic course, my most loyal support, and I think satisfied his scruples on that point. He suggested that it would materially aid him in reconciling the Nova Scotia party if the Government here would throw upon your Administration the duty of dealing with the question, and I undertook to aid in that matter. If there is any faith in men I think I may consider the matter, if judiciously managed by you, *settled*. I have assured him of a seat in the Cabinet, and at the Intercolonial Railway Board for Nova Scotia members, and the fullest and most favourable consideration, financially and otherwise, for the province from your Government.

The matter was more serious than we supposed. The duke told me that five of his colleagues, until they heard my explanations, were satisfied that N. S. had strong grounds of complaint, and the effect of keeping up the impression *here*, and in the U. S., that the union is not to be permanent, has a most injurious effect. After talking the matter over with the duke after Howe had left, he requested me to give him my suggestions as to a despatch in answer to Howe and Co., and I sat down and hurriedly wrote the paper of which you have here a copy.* The duke said it entirely agreed with his own views. I hope the course I have taken will be approved."

On May 26th Tupper again writes Macdonald:†

"Howe drove me home in his cab from the Lyceum last Thursday evening, and invited me to breakfast with Mrs. Howe and himself the next morning, when we had two hours' conversation in her presence and went fully into the whole matter. She goes with me strongly, and I have no doubt that his mind is quite made up. I put it to him strongly that with the course you had taken I would now be able to take the platform and carry the country against any opposition he could bring, but preferred, as the province had pronounced in his favour, to stand aside myself and let them have the legitimate fruit of their popular triumph, and thus bring all into complete harmony at once. I am satisfied that he is fully convinced that the interests of his country, his party, and himself all require him to take hold with us, but both he and I feel that we must handle the subject with great delicacy."

Three days earlier Howe had written:‡

"Tupper is here, and we are very civil to each other, but we must fight our battle out. We are both too old soldiers to play tricks on each other."

* Compare the draft given by Tupper to Buckingham, *Ibid.*, 82-3, with Buckingham's despatch to Monck, in Campbell's *Nova Scotia*, 460-61.

† *Recollections*, 91-2.

‡ *Speeches*, 534.

On the 16th June Mr. Bright moved in the Imperial House of Commons for a commission to inquire into the causes of discontent in Nova Scotia. The motion was voted down by an overwhelming majority. Howe had shot his last bolt, and missed the target. Before returning to Nova Scotia he and his associates published a formal protest, the substance of which is given in Campbell's *Nova Scotia*, 462-63. Tupper sailed for Halifax on the same boat with Howe, Annand and the other members of the Repeal delegation, and they forgot their political differences in a series of rubbers of whist. The subsequent negotiations between Macdonald and Howe, leading up to the Better Terms Arrangement and Howe's acceptance of a seat in the Dominion Government, and the consequent break between Howe and many of his former associates in Nova Scotia, who clung obstinately to their Repeal principles and would accept no compromise, are matters of history that have been quite fully set forth in the published correspondence and biographies of Howe, Tupper and Macdonald. See particularly chapters 33, 34, and 35 of Howe's *Speeches and Public Letters*, and the *Memoirs of Sir John Macdonald*, II, 27-37 and Appendix xviii.

BIBLIOGRAPHY.

1. *Speeches and Public Letters of Joseph Howe*. Edited by William Annand. Boston, 1858. 2 vols. New and enlarged edition, edited by J. A. Chisholm. Halifax, 1909. 2 vols.
2. *Life and Times of Joseph Howe*. By G. E. Fenety. St. John. 1896.
3. *Joseph Howe*. By J. W. Longley. Toronto. 1906.
4. *Joseph Howe*. By G. M. Grant. Halifax. 1906.
5. *The Tribune of Nova Scotia*. By W. L. Grant. Toronto. 1916.
6. *Three Premiers of Nova Scotia*. By E. M. Saunders. Toronto. 1909.
7. *Builders of Nova Scotia*. By J. G. Bourinot. Toronto. 1900.
8. *Nova Scotia in its Historical, Mercantile and Industrial Relations*. By Duncan Campbell. Montreal. 1873.
9. *History of New Brunswick*. By James Hannay. St. John. 1909. 2 vols.
10. *Memoirs of the Right Honourable Sir John Alexander Macdonald*. By Joseph Pope. Ottawa. 1894. 2 vols.
11. *Sir John A. Macdonald*. By George R. Parkin. Toronto. 1908.
12. *Recollections of Sixty Years*. By Sir Charles Tupper. London. 1914.

13. Political Reminiscences of Sir Charles Tupper. Edited by W. A. Harkin. London. 1914.
14. Life and Letters of Sir Charles Tupper. By E. M. Saunders. London. 1916.
15. Sir Wilfrid Laurier and the Liberal Party. By John S. Willison. Toronto. 1903. 2 vols.
16. Reminiscences. By Richard J. Cartwright. Toronto. 1912.
17. Speeches on Canadian Affairs by the Earl of Carnarvon. Edited by Sir Robert Herbert. London. 1902.
18. Speeches in Canada. By Viscount Milner. Toronto. 1909.
19. Confederation: Being a Series of Hitherto Unpublished Documents. Edited by Joseph Pope. Toronto. 1895.
20. Parliamentary Debates on the subject of the Confederation of the British North American Provinces. Quebec. 1865.
21. Confederation; or the Political and Parliamentary History of Canada from the Conference at Quebec to the admission of British Columbia. By J. H. Gray. Toronto. 1872.
22. Confederation Movement in Prince Edward Island. By A. A. Macdonald. (In "Canada: an Encyclopædia of the Country," V, 432).

CONFEDERATION PAMPHLETS.

23. Remarks on a Legislative Union of the Provinces of British North America. By O. T. Cobourg, U.C.: Printed at the Star Office, Cobourg, by R. D. Chatterton. 1839. 24mo., 113 pp.
24. British American League. Speech of J. W. Gamble, Esq., delivered at the convention of delegates, Saturday, November 3rd, 1849, for an appeal to the Legislature, for authority to hold a convention of delegates, to draw up a new constitution for the United Provinces of British North America. Toronto: Printed at the Patriot Office, Yonge Street, 1849. 8vo., 8 pp.
25. Federative Union of the British North American Provinces. By Henry Sherwood. Toronto: Printed by Lovell and Gibson, Front Street. 1851. 8vo., 21 pp.
26. Letter to the Hon. Francis Hincks, being a review of his reply to Mr. Howe's speech on the Organization of the Empire. London: James Ridgway, Piccadilly. 1855. 8vo., 40 pp.
27. Question of Federation of the British Provinces in America. (Confidential). Colonial Office, November, 1858. 4to., 18 pp.
28. On the intention of the Imperial Government to unite the Provinces of British North America, and a review of some events which took place during the Session of the Provincial Parliament in 1854 in Quebec. By Henry Taylor. Toronto: 1858. 12mo., 117 pp.

29. Etude sur l'Union projetée des provinces britanniques de l'Amérique du Nord. Quebec: 1858. 8vo. 36 pp.
30. Union of the British North American Provinces considered in a letter addressed to the Citizens of British America. By Obiter Dictum (James Anderson, F.R.S.E.). Montreal: Printed by Owler and Stevenson, St. François Xavier St., 1859. 8vo. 16 pp.
31. Letter to His Grace the Duke of Newcastle, upon a Union of the Colonies of British North America. By P. S. Hamilton. Halifax, N.S.: James Bowes and Sons, Printers. 1860. 8vo., 18 pp.
32. Letter to the Right Honourable C. B. Adderley, M.P., on the Relations of England with her Colonies. By The Hon. Joseph Howe, Premier of Nova Scotia. London: Edward Stanford, 6. Charing Cross, S.W. 1863. 8vo., 61 pp.
33. Intercolonial Union. The proposed constitution as adopted by the Quebec Conference in October, 1864. Montreal: M. Longmoore & Co., 31 Great St. James St., 1864. 8vo., 15 pp.
- 33a. Remarks upon the proposed Federation of the Provinces. By A Nova Scotian. Halifax. 1864. 8vo.
- 33b. Dawn of a new Empire, being a Reply to "Remarks upon the proposed federation of the Provinces, by A Nova Scotian." By a British-American. Halifax. 1864. 12mo., 11 pp.
34. Union of the Colonies of British North America: being three papers upon this subject originally published between the years 1854 and 1861. By P. S. Hamilton, Barrister-at-Law, etc. Montreal: Printed by John Lovell, St. Nicholas Street. 1864. 8vo., 103 pp.
35. Speech on the Proposed Union of the British American Provinces, delivered at Sherbrooke, C.E. By the Hon. A. T. Galt, Minister of Finance. 23 November, 1864. Reprinted from the Montreal Gazette. Printed by M. Longmoore & Co., 31 Great St. James Street. 1864. 8vo., 24 pp.
36. The Future Government of Canada; being Arguments in favor of a British American Independent Republic. Comprising a Refutation of the position taken by The Hon. T. D'Arcy McGee in the British American Magazine. By T. Phillips Thompson of St. Catherines, C.W. St. Catherines: H. F. Leavenworth's "Herald" Power Press. 1864. 8vo., 24 pp.
37. The Crown and the Confederation. Three Letters to the Hon. John Alexander McDonald. Attorney General for Upper Canada. By A. Backwoodsman. Montreal: John Lovell, Printer, St. Nicholas Street. 1864. 8vo., 36 pp.

38. Correspondence relative to a meeting at Quebec of delegates appointed to discuss the proposed Union of the British North American Provinces. London: 1865. Folio. 14 pp.
39. Speeches and addresses chiefly on the subject of British American Union. By Thomas D'Arcy McGee. London. 1865. 8vo., 308 pp.
40. Resolutions relative to the Proposed Union of the British North American Provinces. Quebec: Printed by Hunter, Rose and Co. 8vo., 13 pp.
41. Correspondence concerning proposals for Inter-Colonial Union, Legislative and Federal. Laid before the Legislature by Command of His Excellency the Lieutenant-Governor. Fredericton: G. E. Fenety, Printer to the Queen's Most Excellent Majesty. 1865. 8vo., 42 pp.
42. The Union of the Provinces of British North America. By the Honourable Joseph Cauchon. Translated by George Henry Macaulay. Quebec: Printed by Hunter, Rose and Co. 1865. 8vo., 154 pp.
43. Discours sur la Confederation. Prononcés par MM. C. S. Cherrier, Charles Laberge et G. E. Clerk. Montreal. 1865. 8vo., 24 pp.
44. The Future of British America. Independence! How to prepare for it. Consolidation is Preparation for a New Nation; Confederation is Preparation for Annexation. Toronto. 1865. 8vo., 16 pp.
45. Speech delivered in the Legislative Assembly by Alexander Morris, during the debate on the subject of the Confederation of the British North American Provinces. Quebec: Hunter, Rose & Co., 1865. 8vo., 15 pp.
46. The Union of the British Provinces. A brief account of the several conferences held in the Maritime Provinces and in Canada, in September and October, 1864, on the proposed confederation of the Provinces, together with a Report of the Speeches delivered by the Delegates from the Provinces on important public occasions. Compiled by Hon. Edward Whelan, M.P.P. Charlottetown, P.E.I.: G. T. Haszard. 1865. 12 mo., 231 pp.
47. Two Speeches on the Union of the Provinces by Hon. Thos. D'Arcy McGee. Quebec: Hunter, Rose & Co. 1865. 8vo., 34 pp.
48. Speech delivered in the Legislative Assembly by Christopher Dunkin, Esq., during the debate on the subject of the Confederation of the British North American Provinces. Quebec: Hunter, Rose & Co. 1865. 8vo., 64 pp.

49. Speech on the Union of the Colonies delivered in the Assembly by A. W. McLelan, Esq., Member for North Colchester. Halifax Morning Chronicle Office. 1865. 8vo., 15 pp.
50. The Independence of Canada. A Tract for General Circulation. By A. Alison, Esq. London: John Redford. 1865. 8vo., 8 pp.
51. The Organization of the Empire. By the Hon. Joseph Howe. London. Stanford. 1866. 8vo., 33 pp.
52. The Confederation of British North America. By E. C. Bolton & H. H. Webber, with maps. London: Chapman and Hall. 1866. 12 mo., 149 pp.
53. Représentations de la minorité parlementaire du Bas-Canada, à Lord Carnarvon, secrétaire des colonies, au sujet de la Confédération projetée des provinces de l'Amérique Britannique du Nord. Octobre, 1866. Montréal. 1866. 8vo., 11 pp.
54. Speeches delivered in the Legislative Council, New Brunswick, on Confederation and the resignation of the Government and correspondence connected therewith. 1866. 4to., 54 pp.
55. Confederation considered in relation to the Interests of the Empire. By the Hon. Joseph Howe. London. Stanford. 1866. 8vo., 37 pp.
56. A Review of the Hon. Joseph Howe's Essay, entitled "Confederation considered in relation to the Interests of the Empire." By P. S. Hamilton. Halifax, Grant. 1866. 8vo., 25 pp.
57. Brief Suggestions in regard to the Formation of Local Governments for Upper and Lower Canada, in connection with a Federal Union of the British North American Provinces. By Alpheus Todd. Ottawa. Desbarats. 1866. 8vo., 15 pp.
58. A Letter to the Right Hon. the Earl of Carnarvon, Principal Secretary of State for the Colonies. By Hon. Charles Tupper. 1866. 8vo., 78 pp.
59. A Letter to the Right Hon. the Earl of Carnarvon, Principal Secretary of State for the Colonies. By William Annand. London. Stanford. 1866. 8vo., 42 pp.
60. Letter from The Hon. Charles Tupper, Provincial Secretary, etc., To the People of Nova Scotia. 1866. 8vo., 8 pp.
61. The Union of the British North American Provinces and The Hon. Joseph Howe. From the Montreal Gazette. Montreal. 1866. 8vo., 8 pp.
62. The Confederation Question considered From a Prince Edward Island Point of View. By W. H. Pope. Charlottetown, Whelan. 1866. 8vo., 28 pp.
63. The Proposed Constitution for British North America. Magazine articles by Goldwin Smith, 1867. 8vo., 11 pp.

64. Letter from A. G. Archibald, Esq., M.P.P., to the People of Nova Scotia, respecting the proposed confederation of the British North American provinces. 24 Nov., 1866. 8vo., 8 pp.
65. Petitions from Nova Scotia against Confederation. (1866). 4to., 8 pp.
66. On the Proposed Confederation of the British North American Provinces. By a Nova Scotian. (Judge Marshall). London. Burns. 1866. 12mo., 16 pp.
67. Responses aux Censeurs de la Confederation. St. Hyacinthe: Imprimerie du "Courrier de St. Hyacinthe." 1867. 16mo., 100 pp.
68. Acte concernant l'union et le gouvernement du Canada, de la Nouvelle Ecosse et du Nouveau Brunswick, ainsi que les objets qui s'y rattachent. Ottawa. 1867. 12mo., 76 pp.
69. Couronnement de dix années de mauvaise administration. Montréal. 1867. 8vo., 48 pp.
70. Contre poison. La Confédération: c'est le salut du Bas-Canada. Montréal. 1867. 8vo., 72 pp.
71. Correspondence respecting the proposed union of the British North American Provinces. (In continuation of papers presented 7th February, 1865). Presented to both Houses of Parliament by Command of Her Majesty. 8th February, 1867. London. 1867. 177 pp.
72. Letter addressed to the Earl of Carnarvon by Mr. Joseph Howe, Mr. William Annand, and Mr. Hugh McDonald, stating their objections to the proposed scheme of Union of the British North American Provinces. London. 1867. Folio, 31 pp.
73. The Proposed British North American Confederation: Why it should not be imposed upon the Colonies by Imperial Legislation. By Edward Goff Penny. Montreal, Herald Steam Press. 1867. 8vo., 24 pp.
76. The Proposed B.N.A. Confederation: A Reply to Mr. Penny's Reasons "why it should not be imposed upon the Colonies by Imperial Legislation." From the Montreal "Daily News." Montreal. 1867. 8vo., 13 pp.
77. An Enquiry into the Merits of Confederation, and the Duty of the Hour. By one of the people. Halifax, Hall. 1867. 8vo., 31 pp.
78. Confederation Considered on its Merits; being an examination into the Principle, Capabilities, and Terms of Union as applicable to Nova Scotia. By a Nova Scotian. (Judge Marshall). Halifax. Muir. 1867. 12mo., 16 pp.

79. A Letter to the Electors of Nova Scotia, being a reply to "Confederation Considered on its Merits." By an Acadian. Halifax. Muir. 1867. 12mo., 16 pp.
80. Manual or Explanatory Development of the Act for the Union of Canada, Nova Scotia and New Brunswick, in one Dominion under the Name of Canada, synthetical and analytical: with the text of the Act, etc., and index to the Act and the Treatises. By John Gooch. Ottawa. Desbarats. 1867. 8vo., 123 pp.
81. Confederation examined in the light of reason and common sense: and The British North America Act shown to be unconstitutional. By Martin I. Wilkins. Halifax. Hall. 1867. 12mo., 47 pp.
82. Report of the Delegation to England to arrange a Union of the British North American Provinces. G. E. Fenety, Printer to the Queen's Most Excellent Majesty. 1867. 8vo., 48 pp.
83. A Plea for the Confederation of the Colonies of British North America; Addressed to the People and Parliament of Prince Edward Island. By Matthew Richey. Charlottetown. Bremner. 1867. 12mo., 24 pp.
84. La Confederation Couronnement de Dix Années de Mauvais Administration. Montreal. 1867. 8vo., 48 pp.
85. British America. Arguments against a Union of the Provinces Reviewed; with Further Reasons for Confederation. By the Hon. J. McCully, Q.C., Member of the Legislative Council of Nova Scotia and one of the Delegates. London. Algar. 1867. 8vo., 32 pp.
86. Has the country been sold? A letter to the Electors of Nova Scotia, in which certain people and pamphlets are reviewed, and certain facts and arguments stated. By a Cosmopolitan. Halifax. July, 1867. 8vo., 29 pp.
87. Copies of Despatches from Viscount Monck forwarding representations from Nova Scotia against the Union, and the answer. London. 1868. Folio. 10 pp.
88. Prince Edward Island. Correspondence respecting the complaint of the Legislature that the terms of Confederation have not been carried out. Ottawa. 1886. 8vo., 40 pp.

HOWE CORRESPONDENCE.

	Page
Letter of Instructions, July 5, 1866.....	423
Howe to Stairs, July 13, 1866.....	425
Howe to Stairs, July 20, 1866.....	426
Howe to Normanby, August 3, 1866.....	427
Howe to Stairs, August 18, 1866.....	427
Howe to Carnarvon, August 6, 1866.....	428
Elliot to Howe, August 16, 1866.....	429
Howe to Elliot, August 17, 1866.....	429
Memo on Intercolonial, August 17, 1866.....	430
Howe to Stairs, August 30, 1866.....	430
Howe to Stairs, September 10, 1866.....	431
Howe to Stairs, September 28, 1866.....	432
Howe to Stairs, October 12, 1866.....	434
Howe to Stairs, November 8, 1866.....	435
Howe to Stairs, November 9, 1866.....	436
Howe to Sir John Hay, November 12, 1866.....	437
Howe to Normanby, November 22, 1866.....	439
Howe to Stairs, November 23, 1866.....	443
Howe to Stairs, December 8, 1866.....	444
Howe to Stairs, December 21, 1866.....	447
Howe to Graham, December 10, 1866.....	448
Rogers to Howe, December 14, 1866.....	449
Howe to Stairs, January 5, 1867.....	449
Howe to Stairs, January 19, 1867.....	451
Howe to Stairs, February 2, 1867.....	453
Howe to Russell, February, 1867.....	454
Howe to Stairs, February 15, 1867.....	455
Howe to Stairs, March 15, 1867.....	456
Stairs to Howe, March 28, 1867.....	459
Howe to Stairs, March 29, 1867.....	460
Garvie's Report, March 15, 1867.....	461
Stairs to Howe, April 11, 1867.....	463
Howe to Robertson, June 20, 1868.....	464
Appendix.....	466

121. That this Act shall be
published in all the Provinces
it is intended to unite, but the
Queen's Proclamation shall
not be issued till the existing
legislature of New Brunswick
and the legislature of ~~Canada~~
~~or Nova Scotia,~~
~~and New Brunswick~~ concerned
after the General Elections, now
pending, have expressed their
opinion of it in address to
the Queen

Halifax, Nova Scotia.

July 5, 1866.

The Hon^{ble}. Joseph Howe.
Sir,

You are aware that at the last general Election in Nova Scotia the subject of a Union of the Provinces was never discussed either in the Newspapers or at the Hustings, and that the opinions of the people in any legal form were not collected either upon the abstract question or upon any form of Union.

You are aware that it has been announced in the organs of the Provincial Government that delegates are to be sent to England¹ in the Steamer of the 19th July, with power to arrange in conjunction with Delegates from some of the other Colonies, a new Scheme of Government for British America, which it is designed to embody in an Act of the Imperial Parliament, to be passed if those Delegates can induce Her Majesty's Government to assume the responsibility of such a measure.

The people of Nova Scotia are naturally very anxious to know whether Her Majesty's Government will seriously entertain this proposition, and if so what time will be allowed after the measure is prepared and printed, for them to review, and

than McCully, Adams G. Archibald, and J. W. Ritchie. Howe refers to these elsewhere as "four lawyers and a doctor undertaking to annex Nova Scotia to Canada." Sir Charles Tupper, Bart. (1821-1915), need not be otherwise described. Henry (1816-1888), became a member of the Government of Nova Scotia in 1852, Solicitor-General 1854, Provincial Secretary 1856, Solicitor-General 1859, and again in 1863, Attorney-General 1866. McCully (1809-1877) was Solicitor-General in 1860, member Legislative Council 1866, appointed Supreme Court of N.S. 1870. Archibald (1814-1892) was Attorney General 1860-63, Secretary of State in Dominion Cabinet 1867, Lieutenant Governor of Manitoba 1870-72, and of Nova Scotia 1873-83, knighted 1885. Ritchie was a member of the Legislative Council and Solicitor General in 1866, appointed to Senate at Confederation, and in 1870 to Supreme Court of N. S., died 1890. New Brunswick was represented by S. L. Tilley (1818-1896), John Johnson (1818-1868), Peter Mitchell, (1824-1899), Charles Fisher (1808-1880), and R. D. Wilmot (1809-1891). Canada sent John A. Macdonald (1815-1891), G. E. Cartier (1814-1873), A. T. Galt (1817-1893), William McDougall (1822-1905), H. L. Langevin (1826-1906), and W. P. Howland (1811-1907).

² In New Brunswick, Tilley appealed to the people on the Confederation issue in 1865 and was defeated. Albert Smith, who succeeded him, held office for only a short time, and was followed by Peter Mitchell. Mitchell went to the country on the question of union with Canada, and was sustained. The legislature endorsed Confederation by a large majority. In Nova Scotia, Tupper took advantage of the favourable action of New Brunswick, and without appealing to the people, secured the approval of the legislature. In both provinces the Lieutenant-Governors, under instruction from the Imperial Government, threw all their influence on the side of union. In Newfoundland and Prince Edward Island both legislature and people were, for various reasons, unalterably opposed to Confederation. Hannay, *New Brunswick*, II, 229-264; Tupper, *Recollections*, 66-71; Pope, *Memoirs of Macdonald*, I, 295-298, 358-360. Macdonald, *Confederation Movement in Prince Edward Island*.

121. That this Act shall be
published in all the Provinces
it is intended to unite, but the
Queen's Proclamation shall
not be issued till the existing

ADDENDA

Add to Note 65, p. 438:

T. C. Kinnear was a partner of A. G. Jones. H. H. Cogswell and James C. Cogswell were well-known Halifax lawyers of the period. James A. Moren and William Pryor, as well as T. C. Kinnear, belonged to the group of prominent merchants on Water Street, Halifax, engaged in the West Indian trade.

Approved U

His Grace

Halifax, Nova Scotia.

July 5, 1866.

The Hon^{ble}. Joseph Howe.
Sir,

You are aware that at the last general Election in Nova Scotia the subject of a Union of the Provinces was never discussed either in the Newspapers or at the Hustings, and that the opinions of the people in any legal form were not collected either upon the abstract question or upon any form of Union.

You are aware that it has been announced in the organs of the Provincial Government that delegates are to be sent to England¹ in the Steamer of the 19th July, with power to arrange in conjunction with Delegates from some of the other Colonies, a new Scheme of Government for British America, which it is designed to embody in an Act of the Imperial Parliament, to be passed if those Delegates can induce Her Majesty's Government to assume the responsibility of such a measure.

The people of Nova Scotia are naturally very anxious to know whether Her Majesty's Government will seriously entertain this proposition, and if so what time will be allowed after the measure is prepared and printed, for them to review, and should it appear objectionable, petition against it. We have therefore to request that you will at once proceed to England and put yourself in communication with Her Majesty's Government in order to ascertain these facts that if necessary steps may be taken without delay to prevent the two Houses of Parliament being misled.

The Scheme of Government arranged at Quebec in 1864, you are aware was distasteful to all the Maritime Provinces and could not be presented and carried in any one of the four Legislatures then existing. Though Elections have since been held in New Brunswick and Newfoundland, the undersigned believe that that Scheme could not in either of those Provinces be carried now, and yet they remember with grave apprehensions for the future that if they had had the power that most unjust and injurious measure would have been forced upon all the Provinces by its framers.² A new one is promised now, and it may be better than the last, but whatever it is the undersigned believe that it should be most carefully matured and only presented

¹ The Nova Scotia delegates to the London Conference were Charles Tupper, W. A. Henry, Jonathan McCully, Adams G. Archibald, and J. W. Ritchie. Howe refers to these elsewhere as "four lawyers and a doctor undertaking to annex Nova Scotia to Canada." Sir Charles Tupper, Bart. (1821-1915), need not be otherwise described. Henry (1816-1888), became a member of the Government of Nova Scotia in 1852, Solicitor-General 1854, Provincial Secretary 1856, Solicitor-General 1859, and again in 1863, Attorney-General 1866. McCully (1809-1877) was Solicitor-General in 1860, member Legislative Council 1866, appointed Supreme Court of N.S. 1870. Archibald (1814-1892) was Attorney General 1860-63, Secretary of State in Dominion Cabinet 1867, Lieutenant Governor of Manitoba 1870-72, and of Nova Scotia 1873-83, knighted 1885. Ritchie was a member of the Legislative Council and Solicitor General in 1866, appointed to Senate at Confederation, and in 1870 to Supreme Court of N. S., died 1890. New Brunswick was represented by S. L. Tilley (1818-1896), John Johnson (1818-1868), Peter Mitchell, (1824-1899), Charles Fisher (1808-1880), and R. D. Wilmot (1809-1891). Canada sent John A. Macdonald (1815-1891), G. E. Cartier (1814-1873), A. T. Galt (1817-1893), William McDougall (1822-1905), H. L. Langevin (1826-1906), and W. P. Howland (1811-1907).

² In New Brunswick, Tilley appealed to the people on the Confederation issue in 1865 and was defeated. Albert Smith, who succeeded him, held office for only a short time, and was followed by Peter Mitchell. Mitchell went to the country on the question of union with Canada, and was sustained. The legislature endorsed Confederation by a large majority. In Nova Scotia, Tupper took advantage of the favourable action of New Brunswick, and without appealing to the people, secured the approval of the legislature. In both provinces the Lieutenant-Governors, under instruction from the Imperial Government, threw all their influence on the side of union. In Newfoundland and Prince Edward Island both legislature and people were, for various reasons, unalterably opposed to Confederation. Hannay, *New Brunswick*, II, 229-264; Tupper, *Recollections*, 66-71; Pope, *Memoirs of Macdonald*, I, 295-298, 358-360. Macdonald, *Confederation Movement in Prince Edward Island*.

to the Imperial Parliament after the most full and ample discussion in all the Provinces whose Institutions it is proposed to revolutionize and whose revenues are to be swept away.

Two years ago the public mind was tranquil and our people mutually respecting and prepared to help each other, contrasted the blessings they enjoyed with the disturbed state of things across the frontier,³ and were content. All this is changed and the undersigned venture to assert that there has been more distrust, animosity and bitter feeling generated of this Quebec Conference and pervading all the Provinces, than has disturbed Society since their first foundation.

The undersigned have seen at a moment when the Provinces were threatened with invasion⁴, the public mind disturbed by rash attempts at innovation, and they see now propositions seriously made by prominent legislators in the Congress of the United States who are publicly entering the field in competition with Canada, for the possession of the Provinces and for a formal transfer of the allegiance of British Subjects.⁵

All this is strange in British America and the people of Nova Scotia, sincerely believe that if any attempt is made in the interests of Canada for her territorial aggrandizement or to relieve her from political perplexities⁶; to break down without the consent of their inhabitants, the system under which all the Provinces have prospered in peace and loyalty, the bitter feuds which now disturb society may culminate in changes which none of us desire to contemplate and all of us will deplore. In view of a future so full of peril the people of Nova Scotia desire to discharge their duty to their Sovereign, to Her Majesty's Ministers and to the two Houses of Parliament, and before they are committed to changes which they foresee will be disastrous, claim at least the opportunity to review the contemplated measure and to put their opinions upon record.

The undersigned cannot believe that Statesmen whose lives are guarantees for the liberality of their sentiments and who rightly appreciate the Keen sense of justice which distinguishes the great Nation over whose counsels they preside will ever countenance the policy proposed. If the elected Aldermen of any English City were in violation of their trust to attempt to transfer the control of its Government and of its Revenues to any other Corporation without the consent of their constituents they would have to look elsewhere than to Ministers of the Crown and to Members of the British Parliament for aid to consummate such a bargain, and the undersigned do not believe that the Act will be regarded as less reprehensible when the Government of a noble Province, inhabited by a spirited and loyal people who have committed no fault, is attempted to be transferred to a distant authority by those who were mere tenants for a limited term and had no right to alienate the trusts committed to their care.

³ The United States were in the throes of the Reconstruction Period, with President Johnson and Congress at daggers drawn, and the country in a turmoil.

⁴ In the plan of operation given out by Genera. Sweeny, the Fenian War Secretary, in March, 1866, Portland was named as the general place of embarkation for "Expeditions against the capitals of New Brunswick and Nova Scotia." In April of the same year, the Fenians made an unsuccessful attempt to capture the island of Campobello, in the Bay of Fundy. Macdonald, *Troublous Times in Canada*, 14, 22-24.

⁵ On July 2nd, 1866, a Bill was introduced in Congress entitled "A Bill for the admission of the States of Nova Scotia, New Brunswick, Canada East and Canada West, and for the organization of the Territories of Selkirk, Saskatchewan, and Columbia." The text of this Bill is given in Macdonald's *Troublous Times in Canada*, 146-48. At the time of the Annexation movement in Canada in 1849 the Vermont Senate adopted an Annexation resolution, and the New York Legislature took similar action the following year. Allin and Jones, *Annexation, Preferential Trade and Reciprocity*, 378-79.

⁶ Racial and political rivalries had produced a deadlock in the government of Canada. Bourinot, *Canada under British Rule*, 195-98.

You will endeavour to make Her Majestys Government sensible that the people of this Province are contented and happy as they are, but that if changes for which they see no necessity are to be discussed, then those changes should be matured with great deliberation, propounded in clear and explicit terms, and that before any measure is submitted to the Imperial Parliament it ought to be accepted by the people whose future it is to affect.

Should Her Majesty's Government, as we cannot doubt they will, acquiesce in the reasonableness of this policy, you will inform us at your earliest convenience.

Should we be disappointed you will then take whatever steps you may consider prudent and legitimate to have the true interests of our country understood by the people and parliament at home.

Should it appear desirable other gentlemen will be sent home to assist you⁷ and Petitions to the House of Commons, now being extensively signed⁸ will be forwarded by the next and subsequent mails.

We have the honor to be,

Sir,

Yours truly,

(Signed by the officers of the League of the Maritime Provinces).

Cork, July 13, 1866.

Wm. J. Stairs, Esq.

My dear Stairs,⁹

I landed here this morning after a charming passage of seven days and a half, and was startled by the News which must have reached you by this time of the retirement of the Whigs and of the formation of a new Ministry under Lord Derby.¹⁰ Under those circumstances it is fortunate that I am on this side, as I know his Lordship personally and will put myself at once in communication with him and with the new Colonial Secretary the Earl of Carnarvon.¹¹ The Departmental elections are nearly over. I presume that the new Ministers will wind up the Parliamentary business as rapidly as possible, so as to get breathing time. If not sustained, which is probable enough they will I suppose dissolve.

Europe is in a blaze of warlike excitement. The Prussians have won a great battle¹² and are carrying everything before them.

My impression is that the Colonial Delegates will still come over and by force of numbers try to get the New Ministry pledged and carry everything before them. But they may not. At all events the change gives us unpledged men to deal with and increases our chances of fair play. I know Sir John Pakington¹³ who is at the head

⁷ The other delegates of the League sent to London were William Annand and Hugh McDonald.

⁸ These petitions are referred to later in Howe's letters to Stairs.

⁹ William J. Stairs, born at Halifax about 1820, died 1897. Son of William Stairs, a famous Halifax merchant of the first half of the last century. One of the founders of the League of the Maritime Provinces, of which he became vice-president. Appointed to Legislative Council of Nova Scotia, 1867. His son, John F. Stairs, represented Halifax in the House of Commons, 1883-1896.

¹⁰ 14th Earl of Derby (1799-1869). Succeeded Earl Russell in 1866 on the defeat of the Reform Bill.

¹¹ 4th Earl of Carnarvon (1831-1890). Resigned from the Cabinet the following year as he could not agree with his colleagues on the question of Parliamentary Reform.

¹² The battle of Königratz, ending the Austro-Prussian War.

¹³ Sir John Pakington, Baron Hampton (1799-1880).

of the Admiralty and may be disposed to hear us on the Naval and Military part of the question, particularly as he has an old grudge against the Canadians.¹⁴

Kind regards to all and

Believe me

Sincerely Yours,

JOSEPH HOWE.

London,

43 Sackville St.,

July 20, 1866.

Wm. J. Stairs, Esq.

My dear Stairs,

I have just had an interview with the New Under Secretary Mr. Adderley,¹⁵ and left with him my Letter of instructions. I am to see Lord Carnarvon whenever I wish an interview which I shall ask for next week.

I spent two days looking for Mr. O'Brien in Ireland and when I got to his place found that he had gone on a visit to the Bishop of Kerry. I shall write and post him up if he does not come to London which I rather hope he will.

The change of Ministry so far works in our favor. The new men, uncertain of a majority on any question, are naturally desirous to see the end of the Session that they may have a six months lease of power, with a chance to strengthen themselves in the chapter of accidents.

The Whigs appear to have wrecked themselves by bad steering and by the want of that amalgum of which Palmerstone had so much,¹⁶ and by which all sorts of elements are bound together for common objects. There is no great excitement in the Country, consequent upon their fall. People talk about the War, the heat and the Bank rate of interest but very little about the Reform Bill.

It is not possible for any Bill of Confederation to be passed during this Session. If the Delegates leave on the 19th they cannot get here before the 29th¹⁷ and as the 4th of Aug. has been named for the close of the Session it would be quite out of the question to expect that Parliament would entertain a measure of such importance even if the Delegates and the Ministry were united in a policy and disposed to press it on.

I shall wait the arrival of the Delegations and then be governed by their action and by the circumstances that grow out of their Mission, and in the meantime shall make what friends I can should help by and bye be required.

With kind regards to all friends.

Believe me,

Yours truly,

JOSEPH HOWE.

¹⁴ Pakington as Colonial Secretary in the previous Derby Administration had strongly opposed the action of the Canadian Government in the matter of the secularization of the Clergy Reserves.

¹⁵ Sir Charles B. Adderley, Under-Secretary of State for the Colonies.

¹⁶ Viscount Palmerston (1784-1865). He has been described as an unrivalled political tactician.

¹⁷ The Canadian delegates did not actually reach London until the middle of November, 1866, although their Maritime Province colleagues had arrived in July. The delay is partly explained in the following telegram from Lord Monck to Sir Fenwick Williams, Lieutenant-Governor of Nova Scotia, July 14th, 1866: "I have seen Dr. Tupper's telegram to Mr. Macdonald. In the present condition of political affairs in England, it is simply absurd to send delegates home until we have some communication with the new Secretary of State. I have a letter from a political friend in England to-day to say that the general impression there is that the session will be immediately wound up whatever ministry is in office. Please keep your people quiet if you can and all will be right." See also Macdonald's letter to Tilley, October 8th, 1866, and Report of Committee of Executive Council of Canada, September 24th, 1866. Pope, *Memoirs*, I, 305-9, 374-76.

43 Sackville Street.

3rd August, 1866.

The Most Honorable

The Marquis of Normanby.

My Dear Lord Normanby,

I now send you Copies of the Newfoundland Petitions¹⁸ to the Lords and Commons and of our own.¹⁹

The Newfoundlanders have put their case with clearness and decision. To transfer the government of that Island to Ottawa would be as absurd as to allow Michigan to govern Jamaica, and yet the Delegates would have done it last year if they had been able, and would tomorrow commit the Government and Parliament of England to this act of cruelty and injustice. The Petition is signed by the principal Merchants of St. John, and by the mass of its male population.

The Nova Scotian Petition expresses, a little too elaborately perhaps the views of our people. It is signed by 18,000 of them which is equal to 1,600,000 of them.²⁰ If the populations are contrasted. If, as my friends assure me they will be, the signatures are swelled to 40,000, these, being 2/3ds of the enrolled Militia of the Province, ought to count for four millions over here.

The question was very fairly treated in the House of Lords.

Believe me,

My Lord,

Very sincerely Yours,

JOSEPH HOWE.

London,

43 Sackville Street,

18 Aug., 1866.

Wm. J. Stairs, Esq.

My dear Stairs,

A day or two before Parliament rose I addressed to the Earl of Carnarvon the letter of the 6th of August which I enclose. It was answered yesterday by Elliot's Letter of the 17th, a copy of which I send, with our reply and Memo. about the Railway which went to the Colonial Office yesterday. These papers will show you exactly how matters stand.

On the 16th an extraordinary article appeared in the Money column of the Times²¹ which startled us a good deal and for the moment created the suspicion that Carnarvon was playing us false. I went at once to Sampson, the financial Editor, explained to him that it was full of errors, and in my judgement had no foundation. He is an old friend, and promised at once to publish any explanation or correct any errors that I might point out. Before writing I wanted to satisfy myself that the main statement was false and that C. had not been such a fool as to commit himself so egregiously. This morning one of the Delegates has been compelled to clear the matter up and it is now apparent that the Colonial Secretary has committed himself to nothing and will not till the Canadians arrive. I had today a very long

¹⁸ Printed in *Correspondence respecting the proposed union of the British North American Provinces*. See Bibliography, No. 71.

¹⁹ See Bibliography, No. 65.

²⁰ "Of them" evidently should read "over here."

²¹ See Appendix.

and interesting interview with Lord Stanley.²² Some of the Delegates have been down to Lord Carnarvon's place, and others or all of them are to visit the Duke of Buckingham's place at Stowe next week. We were not invited but have friends enough and keep our eyes steadily on the game, and hope to win it.

Do not neglect the petitions. It is all important that we shall be able to show that the manhood of our country is adverse. 1,500 names out of 30,000 are too few for Halifax. Pray see that the work goes on. We must have the 40,000.

I send you the two articles from the Times,²³ which with our Memo. will explain themselves.

It is not quite clear here whether the Times Article originated in a bit of blundering brag on the part of some of the Delegates, or in a desire to puff up the Grand Trunk Stock. In either case it must damage the fellows and has given us a capital chance to put in a few words of caution that can do no harm.

We do not intend to expand our views on the general subject just yet. We think it better policy to wait till we have something tangible to deal with, and make the fellows propound their scheme before we uncover our batteries.

Believe me, with kind regards to all friends.

Yours truly,

JOSEPH HOWE.

See Editorial in the Times of today and my explanation in letter to Mrs. Howe.

London,

No. 43 Sackville Street,

Aug. 6, 1866.

The Right Hon.

The Earl of Carnarvon.

My Lord,

As the pressure of public business, when I reached London, left Your Lordship but little leisure I was reluctant to occupy your time till after the close of the Session, and thought it better, before asking for an interview, that the gentlemen who seek to disturb the existing order of things should first be heard.

When Your Lordship can spare time to peruse the papers which I have the honor to enclose Mr. Annand and myself will be happy to pay our personal respects to your Lordship and to discuss with you the views of those we represent.

I have the honor to be

My Lord,

Your Lordship's

Most Obedient

Very humble Servant,

JOSEPH HOWE.

ENCLOSURES

1. Constitution of League of the Mar. Provinces.²⁴
2. Letters of Instructions.
3. Petitions to the Queen.
4. Petition to the H. of Commons, Nova Scotia.
5. Do. Newfoundland.

²² Afterwards 15th Earl of Derby (1826-1893). He was in 1866 Foreign Secretary in his father's third ministry.

²³ Established in 1788. Edited in 1866 by John Thaddeus Delane.

²⁴ See Appendix.

Downing Street,
16 August, 1866.

The Honorable Joseph Howe.
Sir,

I am directed by the Earl of Carnarvon to acknowledge the receipt of your Letter with its enclosures dated the 6th instant, relative to the proposed Confederation of the British North American Provinces.

I am to acquaint you in reply that Lord Carnarvon will be ready to receive at once any written communication from you on the subject to which these documents refer, or, if you and Mr. Annand should prefer to see His Lordship, he will be happy to appoint a day for that purpose about a fortnight hence.

I am at the same time to observe to you that His Lordship will shortly be called upon to enter upon the consideration of the question of Confederation with Delegates deputed by the Governments and Legislatures of their several Provinces to treat with the Imperial Government, and that His Lordship whilst very happy to receive any communication from yourself and Mr. Annand would not consider himself at liberty to anticipate the discussion of this important subject with the gentlemen who have been so accredited to Her Majesty's Government.

I am
Sir,
Your obedient Servant,
P. F. ELLIOT.

43 Sackville Street,
17 August, 1866.

P. F. Elliot, Esq.
Sir,

Referring to your Letter of yesterday, Mr. Annand and myself have to request you to convey to the Earl of Carnarvon our thanks for the Message which you were directed to communicate.

We have no desire to "anticipate" the discussion of Confederation. On the contrary, entirely satisfied with the Manner in which His Lordship treated the subject in his place in Parliament, we are content, having submitted the documents with which we were entrusted and placed ourselves in official communication with the Department, to wait His Lordship's pleasure, sincerely anxious to afford all the information in our power, and cause the least embarrassment.

Will you kindly assure the Earl of Carnarvon that we gave no credence to the statement made in a Morning Paper that His Lordship had already arranged the details of a new scheme of Confederation with the Delegates from Nova Scotia and New Brunswick without notice and without discussion. We have no desire to enter prematurely even on that branch of the general subject which touches the Inter Colonial Railway, but as a very imperfect account of the real state of that question has been put before the public, we have prepared a brief Memorandum for the Colonial Secretary which is enclosed.

I have the honor to be
Sir,
Your obedient Servant
JOSEPH HOWE.

*Memorandum.**Inter Colonial Railway.*

Referring to the Statement made in the Money Article of the Times of the 16th instant, the undersigned desire to explain that neither by Earl Grey in 1851 nor by the Duke of Newcastle in 1862 was the guarantee for the Inter Colonial Railway made dependent on the acceptance by the Provinces of Confederation.²⁵ Mr. Howe conducted the first negotiation alone, and was a party to the second, and had the proposition to surrender the revenues and government of Nova Scotia to the Canadians as the price of the guarantee been made, it would have been instantly rejected. The guarantee was yielded as a favor to the Provinces, without any stipulation, and if the terms were afterwards changed to enable Canada to carry by Imperial pressure what public opinion condemned it was a great mistake, which the undersigned would respectfully suggest, ought not to be repeated.

The writer conceals the facts that since 1862 Nova Scotia has provided for the whole of the Inter Colonial Road within her territory which is now under Contract and in course of construction, and that the Report of Mr. Flemming^{25a}, the Canadian Engineer, swelled the cost of the work from £3,000,000 to £4,000,000.

No steamers have yet been placed on the route between Portland and Halifax.

The undersigned have always been advocates and friends of the Inter Colonial Railway. They are yet, but there is a time for every thing, and they doubt whether when the people of England are considering how their supremacy upon the sea, seriously endangered if not lost, can be recovered, and how, the Empire is to be defended without breech loaders is just the time for the Chancellor of the Exchequer to go down and ask Parliament for four Millions to be expended in a country which we really have at this moment no assurance can be successfully defended. Turret ships and needle guns first and the Inter Colonial Railway afterwards would seem to be the natural order in which to consider these subjects, and the Colonial Secretary ought not to be asked hastily to bind himself by any pledge on a financial question like this of which, when Parliament meets, views, not quite in accordance with those of the Delegates may be taken.

London, 43 Sackville,
17 August, 1866.

JOSEPH HOWE
WILLIAM ANNAND.

London,
43 Sackville Street,
Aug. 30, 1866.

Private.

Wm. J. Stairs, Esq.
My dear Stairs,

James Duffus goes by this Boat and will give you all the News. John Tobin also returns home, and you will probably have his version of things in general through some of his friends. I yesterday met him at dinner with the Archbishop. He does not say much about Confederation, but we are under the impression that he is very much mortified at being left out in the cold, while his quandom friends have been visiting the great folks. He certainly has been scurvily treated, and would, I think,

²⁵ The officers of the League were at this time: President, Joseph Howe; Vice-Presidents, W. J. Stairs and Patrick Power; Secretaries, William Garvie and Robert J. Weatherbe; Treasurer, Robert Boak.

^{25a} Sir Sandford Fleming (1827-1915).

deeply resent it but for the influence of His Grace, with whom I had a long conversation yesterday. He is prepared to demand large concessions from the Canadians, and is determined to throw up the game and go home if they are not yielded. I read him last night the four declarations, made in a string, by the Canadian Ministers and their friends in which they say that nothing shall be changed. We shall see who will yield. It is quite clear that both sides are committed to directly opposite policies.

I sent last week to Lord Stanley two papers on subjects which I know would interest him. He thanked me promptly under his own hand and said he had sent the "interesting Papers to the Earl of Derby."

Going down for four days to Gravesend I have prepared a paper on the "pretensions of Canada," embracing general and Imperial views of Confederation. Annand and I have been at work at it since, and we have sent 60 pages of MS. to the printer this morning. We have some more to do but hope to have the whole in a readable shape next week. The exact mode of publication and procedure we have not quite determined on but these will be governed by the state of the board when the proofs are ready.

I learn from reliable quarters that the treatment the fellows here have received from the Canadians has produced among the more outspoken and irritable a feeling of great annoyance and disgust.

Be careful in using the contents of this, and be assured that, up to this moment the situation is unchanged, and that nothing whatever has been done.

Yours truly,

JOSEPH HOWE.

London,

Sept. 10, 1866.

25 Saville Row.

My dear Stairs,

Thanks for your Note. After a long survey of the field of operations here and much reflection on the course to be pursued, Annand²⁶ and I determined that we would strike a bold stroke for the Provinces which might startle the government and influence the public opinion of this country. Had we noticed the articles in the Times we might have frittered away our case and been drawn into small wars with the Delegates with no decisive result. We determined therefore to reserve our fire till we could deliver a broadside, of heavy metal. I went down to Gravesend and shut myself up for a week and prepared the paper, copies of which are enclosed.²⁷ We were doubtful at first whether to try and get this into one of the papers under an anonymous signature. We concluded, however, that the bold course was the best, and I have put my name on the title page and published in pamphlet form. An edition of 500 has been ordered, and as we propose to send it to every Member of both Houses and to all the Newspapers 1,000 more may be wanted, as a good many should go to New Brunswick, Prince Edward Island and Newfoundland. This operation will cost our friends some money, but I know they will not grudge the expense.

Though I have written this paper it embodies our joint suggestions and Annand has aided me much by discussing with me the various points and by corrections.

²⁶ William Annand. Born Halifax 1808. Elected to N. S. Assembly, 1836. Financial Secretary in Howe's Ministry, 1860-63. Founded *Halifax Chronicle* and for some time edited both that and the *Nova Scotian*. Head of Anti-Confederate Government, Nova Scotia, 1867. Died in London, 1892.

²⁷ See Bibliography, No. 55. The pamphlet is reprinted in the *Speeches and Public Letters of Joseph Howe*, II, 468-92.

On Friday last I sent proof sheets to Lord Stanley, and received from him a kind note. Mrs. Howe has the correspondence and will show it to yourself, Power²⁸ and Jerry.²⁹ It should go no further at present, and must be regarded as strictly confidential.

The paper had better be republished at length in our Halifax and country papers. I will send some copies direct to Newfoundland and P.E.I. and have written to the Editors of the New York Albion³⁰ who I hope will give it at large.

I shall now send Copies to the Members of the Cabinet and write enclosing it to such leading Members of both Houses as I happen to know.

Remember us to all friends and believe me,

Sincerely Yours,
JOSEPH HOWE.

We have been driven out of our old lodgings by repairs going on in the rear

Byron, when in town, lived in this house and I suppose wrote here his English Bards and Scotch Reviewers.³¹ We breakfasted this morning in his study.

London,
25 Saville Row,
Sept. 28, 1866.

Wm. J. Stairs, Esq.
My dear Stairs,

By the last mail I sent you copies of our Pamphlet and forwarded copies to many of our friends at home and in the other Provinces, and wrote a few lines of explanation or recognition to forty or fifty people who might be gratified to hear from me.

Within the fortnight we have sent Pamphlets to all the Ministers and leading Members of both Houses of Parliament—to the principal Newspapers and periodicals in England, Ireland and Scotland, accompanied by 48 letters to persons who we know personally or with whom we could fairly take the liberty. We sent a circular to all the Scotch Editors reminding that old Scotland should stand by her namesake and see that she got fair play. Many of the answers received from persons written to are very satisfactory and prove that our labor will not be lost. We have nearly exhausted an edition of 500 in these operations, but 500 more are being struck off which we will send to Members of both houses, Clubs, Chambers of Commerce, and Reading Rooms. We shall ruin you all I fear with printing, and postage, but there was no other way to reach the governing classes here and to change the stream of public opinion.

²⁸ Patrick Power, (1815-1881) one of the Vice-Presidents of the League. Represented Halifax in the first Parliament of Canada, 1867. Re-elected 1874.

²⁹ Jeremiah Northup, one of the leaders in the Anti-Confederation Movement. Born 1815. He was Commissioner for issuing Provincial Notes in 1866, and represented Halifax in the Assembly 1867. Appointed to the Senate 1870. Died 1879.

³⁰ A weekly newspaper published in New York, chiefly for British readers in the United States. Peter Brown, father of George Brown, and founder of the Toronto *Banner*, was a contributor to the *Albion* in 1838. Howe was offered the editorial management of the paper in 1866. See Longley, *Joseph Howe*, 182-84.

³¹ Published in 1808.

So far, we have every reason to be satisfied with the result. The *Daily News*³² has given two articles and the *Star* (Bright's organ)³³ one to the subject and we are promised others from other quarters in good time.

The Delegates here were evidently taken by surprise by this movement. We did not let a soul of them know what we were about and by selling no copies till they were sowed broadcast over the three Kingdoms and in the Provinces we have taken a rise out of them.

Tupper has rushed into print³⁴ but Annand answers him in the next No. of the *Star*³⁵ and he will find he has taken nothing by that motion.

Annand has been very active and very useful in personally visitting and discussing the question with leading men connected with the London Press. Even where we could not get them to suddenly change previously expressed opinions they have been modified, or the parties have promised that they would see that we were not unfairly expressed.

From present appearances I should think that some if not all the Delegates are preparing for a homeward flight. The Canadians are not coming till January if they come then,³⁶ and John A. McDonald expressly tells them that they should arrange their local Constitutions before asking for an Act of Parliament.³⁷

It is quite evident that, in coming here at all, they made an egregious blunder. They do not look very happy but we keep our own Secrets and do not enquire into theirs.

Though anxious to get home I cannot yet determine whether I can get away by next Boat or not. As soon as I am satisfied that no further good can be done here I will go out and see what is necessary to complete the work at home.

They must have a Session, and if we manage right we may get the Resolution³⁸ reversed.

Annand will write and send the papers and in the meantime

Believe me,

Truly Yours,

JOSEPH HOWE.

29th

Since writing to you Jonathan³⁹ has rushed into print and has got an admirable dressing down from the Editor of the *Daily News*, and John A. McDonald and his drunken crew have got a fearful castigation from the Editors of the *Telegraph*.⁴⁰ Annand will mail both papers.

I fear it will not be possible for us to leave here by next boat, but we shall try hard to get away by the end of the month.

³² Founded by Charles Dickens in 1846, and edited by him for a short time. Edited by Thomas Walker 1858-69. Radical in politics.

³³ Founded 1856. Radical of the Manchester School. Edited by Samuel Lucas 1856-65; and by Justin McCarthy 1865-68. The *Evening Star* ceased publication 1869, and the same year the *Morning Star* was absorbed in the *Daily News*.

³⁴ Tupper's letter, which appeared in the *Star*, September 26th, is reprinted in his *Recollections*, 46-50.

³⁵ September 27th.

³⁶ As already mentioned they arrived in November.

³⁷ A somewhat different attitude is revealed in Macdonald's letter to Tilley of Oct. 8, 1866. Pope, *Memoirs*, I, 305-9.

³⁸ See Campbell, *Nova Scotia*, 445.

³⁹ Jonathan McCully. See Note 1.

⁴⁰ Founded 1855. First editor, Thornton Leigh Hunt, son of the poet. George Augustus Sala joined staff 1857, and Edwin Arnold in 1861. Liberal in politics.

London,
25 Saville Row,
Oct. 12, 1866.

Wm. J. Stairs, Esq.

My dear Stairs,

I was glad to learn, by letters from home that the Pamphlet had been well received by our friends. It would have been issued earlier but it takes some time to survey a wide field like this and measure the forces to be overcome. Annand and I were for a time much perplexed as to the line to be taken and it required some self restraint to keep from rushing into the Newspapers when we first came over. But we determined, I think wisely, to reserve our fire till we could send a shot heavy enough to go straight to the highest ranges in this country and to break down a good deal of ignorance and prejudice beyond the Sea. So far we have been rewarded for our patience and our labor. Judging by what our friends say good will be done in the Provinces and among our own people, and here the results of the explosion have been most satisfactory.

We sent you by last Mail articles from the *Daily News*, *Star* and other papers. Tupper and Jonathan have kept out of print since the former was answered by Annand and the latter snubbed and silenced by the Editor of the *Daily News*.

In the meantime the Pamphlet has been noticed and the subject discussed in other London Papers, and I presume has been aired in Scotch and Provincial ones which we do not see.

Annand will send you articles from the *Express*,⁴¹ a moderate paper usually in a quiet way, taking its tone from Government, *The Athenaeum*,⁴² the principal Literary organ of the Metropolis which rarely meddles with mere political questions, from *Lloyds' Weekly*,⁴³ which has an extensive English and Colonial circulation. From the *Patriot*,⁴⁴ the organ of the Independents, which is read by twenty odd Members of Parliament who sympathize with their Congregations. All these Notices are decidedly favorable, and taken in connexion with the articles in the *Star* and *Daily News*, show that our case has made a most favorable impression, particularly when it is remembered, that, until we came here not a single London paper had expressed an opinion except on the other side. The article from the *London Review*,⁴⁵ which Annand also sends and another from the *Spectator*,⁴⁶ are the only ones we have yet seen that are hostile. Both can be easily answered, and we may do this but are a little doubtful about the policy of entangling ourselves in small wars with particular Newspapers. It is more dignified and in the end will produce a finer effort in this country, to take high ground and enlarge rather than narrow the boundaries of discussion. With this view I have prepared another paper on the "Organization of the Empire"⁴⁷ which is now ready for the Press, and which we hope to have ready to go out by the next mail. It is more calm and moderate in tone, and develops a

⁴¹ Established 1846. Started as an afternoon supplement to the *Daily News*. John R. Robinson editor, 1855. Paper discontinued 1869.

⁴² Founded 1827 by J. S. Buckingham. Edited by Hepworth Dixon 1853-69.

⁴³ Founded 1842. Radical in politics. Douglas Jerrold editor 1852-57; succeeded by his son, Blanchard. It had reached about this time the then enormous circulation of 400,000.

⁴⁴ Established 1833. Edited by Joseph Condor for twenty-two years.

⁴⁵ Established by Charles Mackay in 1860. Laurence Oliphant was associated with him. See *Mackay Through the Long Day*, II, 201-12.

⁴⁶ Founded 1828. First editor R. S. Rintoul 1828-58; succeeded by Meredith Townsend and R. H. Hutton, the former as political editor and the latter as literary editor.

⁴⁷ See Bibliography No. 51. The pamphlet is reprinted in his *Speeches* II, 492-506.

scheme of government for the whole Empire. Whether or not the views propounded meet with general favor it will excite discussion on a subject of the highest National importance and as I have to some extent got the ears of the British public I hope to lose no credit by this second attempt to instruct the governing classes of this country. I wish I was rich enough to go into Parliament and I should then have little fear that in five years we should have a scheme of Government sufficiently expansive to include the whole Empire.

From many private letters I am every day more and more convinced that we are making progress here.

Acting on the policy with which we set out that it would be wise to leave the Colonial Secretary free from all suspicion of being influenced by us, while keeping open channels of communication in other directions we have refrained from writing to him since the official correspondence passed that we sent you some time ago. But the general charges of drunkenness and neglect brought against John A. Macdonald and the Canadian Ministers coming over, and the London Telegraph having scourged them in a capital article we thought the matter might be improved, and accordingly addressed to Earl Carnarvon on the⁴⁸

London,
25 Saville Row,
Nov. 8, 1866.

Wm. J. Stairs, Esq.

My dear Stairs,

By this mail you will receive Annand's answer ⁴⁹ to Tupper's Pamphlet⁵⁰ which I trust our friends will like. It will be widely circulated here early in the week. Instead of confining himself to a mere criticism of the Doctor's text you will find a good deal of new matter on various branches of the subject very hard to be got over.

So far, we have seen no notice of the Dr.'s Pamphlet in any paper, but the Canadian News. There may have been others but if there were we have not happened to buy the papers. His paper will not do much harm when Annand's gets into the right hands.

You will find in yesterday's Daily News another capital column of fun poked at our friends by the Editor, and a long letter from Montreal in which our views of the indefensibility of Canada are freely admitted.

I met at dinner last night a Member of Parliament, a friend of Carnarvon's, and a supporter of the Government. He says that C. is doing nothing and is yet unpugged about Confederation, and that Parliament will not be asked to ratify any scheme that has not been approved by the Colonial Legislatures. This would be a great point gained, as it would remove the Controversy to the Colonies again and multiply the chances in our favor. Of course a dissolution would be better but that may come.

We shall do nothing further now till the Canadian men are here. Things must then take some shape that will enable us to determine our future movements.

⁴⁸ Remainder of letter missing. See Note 108. Howe refers here to two long letters sent to Carnarvon.

⁴⁹ See Bibliography No. 59. Summarized in Campbell, *Nova Scotia*, 447-48. Campbell says of it, "His defence of Mr. Howe was as adroit and skilful as in the circumstances it could be, but Dr. Tupper had so effectively used the *argumentum ad hominem* in dealing with Mr. Howe that no defence could repair the temporary damage done to the reputation for political consistency of the Anti-Confederate champion."

⁵⁰ See Bibliography No. 58. Campbell *Nova Scotia* 446-47; Tupper, *Reminiscences*, 33-35; Grant, *Tribune of Nova Scotia*, 144.

A great deal of the work will have been done by the publication of the Pamphlets, and I am in great hopes that we may be able to leave by the end of the month unless some unforeseen necessity for a longer stay arises.

I fear that there is some mistake about the Petitions. McDonald⁵¹ and Garvie⁵² write as though 40,000 Signatures have been sent. There may be that number but we have not received them. We have only received two batches since Annand came over about 34 or 35,000 in all. If there are any more we should have them without delay.

You will see that a writer in the Diplomatic Review has hit the nail square on the head, and accuses Lord Monk of Treason for attempting to make new nations out of the Empire.⁵³

With kind regards to all friends.

Believe me,
Sincerely Yours,
JOSEPH HOWE.

London,
25 Saville Row,
Nov. 9, 1866.

Wm. J. Stairs, Esq.

My dear Stairs,

After I wrote you yesterday we discovered that the *Standard*⁵⁴ (the organ of the Government) had a long article endorsing my views of the Organization of the Empire. We have other indications that the subject is received with favor in influential quarters. The Receiver General of Victoria, who is here and who is much with Carnarvon, wrote to me to say that he entirely approved of my policy. The *Canadian News*, though opposed to us stoutly on Confederation, does the same. If no other good comes of it a diversion will be made that may be fatal to Confederation, at all events till we get an election, and perhaps lead to the whole subject being referred to a Committee of the House of Commons which could not collect evidence and report under two years.

The *Daily News* of yesterday contains another spirited and damaging assault on the Canadians and in this morning's number there is an article signed a "Tax Payer" which gives them some home truths.

In the *London Examiner*⁵⁵ of this morning there is a long letter from Montreal in which the writer makes some curious revelations anent the Canadian School ques-

⁵¹ Hugh McDonald, born Antigonish, N.S., 1827. Represented Inverness in N. S. Legislature Sat in House of Commons 1867-73. President of Privy Council 1873. Judge of Supreme Court of N. S., 1873-93. Died 1899.

⁵² William Garvie, one of the Secretaries of the League. Died 1872.

⁵³ Howe in his pamphlet *Confederation considered in Relation to the Interests of the Empire*, quotes Lord Monck's speech on closing the last session of the Canadian Parliament: "Referring to the proposed confederacy, His Lordship describes it as 'that new nationality of which you will form a part, and the dimensions of which will entitle it to a first place amongst the powers of the world.'" Lord Monck (1819-1894) was the last Governor of Canada before Confederation, and the first Governor-General of the new Dominion. His deep interest in the Confederation movement is revealed in his correspondence with Macdonald. Pope, *Memoirs*, I. 299-303; 372, 373.

⁵⁴ Founded 1827. Changed from morning to evening paper in 1857, when it was acquired by James Johnson. Tory in politics.

⁵⁵ Founded 1808 by John and Leigh Hunt. The latter edited the paper for several years. He was fined five hundred pounds in 1813, and sentenced to two years' imprisonment, for describing the Prince Regent as "a corpulent Adonis of fifty." John Morley was editor of the *Examiner* between 1859 and 1864. It ceased publication in 1880.

tion,⁵⁶ and the religious rivalries and antagonisms of the two Provinces. Annand will mail all these papers that our friends may see exactly how the game stands.

On the other side you will find a sharp article, pitching into me, in this morning's Star, founded on Tupper's views of my inconsistencies. All this will be set right by Annands' Pamphlet which will be circulated on Monday.

The Star is said to be Bright's organ, and as the franchise is the great question with them, they have shifted their ground since the publication of the first article, and are evidently disposed to back Tupper because they have been told that he opposed the limitation of the franchise in Nova Scotia.⁵⁷ Of course, in such a battle as we are fighting we must be prepared for blows and fortunately I have had so many that another thump or two makes but little odds. I may by and by, if it is worth while, review the criticisms of the Press, but if we can turn the rascals' flanks by a Parliamentary enquiry into the whole subject we shall have carried our point. We send the Star that you may see both sides.

In my letter of yesterday I expressed a hope that we might be able to get home by the end of the month. We shall work to accomplish this, but it is by no means certain. The subject is assuming such proportions that I may have to visit the large towns and do much work should the fellows happen to agree⁵⁸ and things take an unfavorable turn. We hope this may be avoided, but nobody just now can tell what may turn up in all this month.

- Believe me

Yours truly,

JOSEPH HOWE.

Private.

25 Saville Row,
12th Nov., 1866.

Sir John C. D. Hay, Bart.

My dear Sir John,⁵⁹

I send you Tupper's pamphlet with Annand's answer to it and Botten and Webber's Book.⁶⁰

Referring to our conversation of Thursday evening I wish to call your attention to two or three points.

1. The opposition to Confederation in Nova Scotia did not originate with me. For weeks after the convention broke up at Quebec I took no part in the controversy, nor did I express any opinion, even to my personal friends, until the delegates set systematically to work to make the people of the Provinces believe that I was in favour of their scheme.⁶¹ I then wrote just what was necessary to disabuse the

⁵⁶ On the Separate School Question in Canada before Confederation, see Lewis, *George Brown*, 121-23, 144-45, and Pope, *Memoirs*, I, 138, 170-72, II, 248.

⁵⁷ See Tupper, *Recollections*, 46, 51.

⁵⁸ There were at the time some differences of opinion between the Maritime Provinces delegates and those from Canada, as to the Intercolonial, and provincial subsidies. The delicate situation during the London Conference has been described by Lord Blachford. Parkin, *Macdonald*, 126-7.

⁵⁹ Rt. Hon. Sir Jofin Charles Dalrymple-Hay, born 1821, rear-admiral 1866, vice-admiral 1875, admiral 1878, Lord of the Admiralty 1866-68, represented Stamford in Parliament, 1866-80.

⁶⁰ See Bibliography No. 52.

⁶¹ Such a statement was not without justification. Howe had advocated Confederation as early as 1849. Grant, *Tribune of Nova Scotia*, 137. As leader of the Government of N. S. he had moved a resolution in the Legislature in the session of 1861 looking to a conference on the question of union of the provinces. Campbell, *Nova Scotia*, 435. On August 13, 1864, he made a speech at Halifax in which he said: "I have always been in favour of uniting any two, three, four or the whole five of the provinces. . . . I am pleased to think the day is rapidly approaching when the Provinces will be united, with one flag above our heads, one thought in all our bosoms, with one Sovereign and one constitution." *Speeches*, II, 433-34. "Nova Scotia," says Munro, "was the first province to propose confederation." *Constitution of Canada*, 25.

public mind upon that point.⁶² I was absent from Nova Scotia seven months in 1865, and ten weeks of last winter was at Washington.⁶³ On returning home this Spring I found the Lieutenant-Governors acting like partizans,⁶⁴ and violating all constitutional principle in order to carry the policy of the convention. I was reluctant to go back into political controversies and asked my old friend Archibald to relieve me from the necessity by giving me an assurance that any measure that might be proposed should be sent for ratification or rejection by the people. He declined to do this and it was, only, when satisfied that the gentlemen who had prepared this scheme intended to seek shelter from all responsibility under an act of parliament, that I took the field in opposition.

2. You know Halifax well and know what weight to attach to the fact when I tell you that, along a mercantile frontage of more than two miles of Wharfs and Stores, hardly seven merchants are in favour of the Scheme. That in Yarmouth the second Seaport in the Province, there are not twenty persons of any position in business or social life who approve of it—that, so strong is the feeling, that Enos Collins^{64a} who is now ninety years of age, and the wealthiest man in British America, declares that, if he was twenty years younger, he would take up his rifle and resist it—that, in all parts of the Province, political parties are broken up and a new one formed the sole object of which is to protect the interests and institutions of the Country.

3. You know that Mather Almon, Andrew Uniacke, Alfred Jones, T. C. Kinnear, James Moren, Wm. Prior, the Cogswell's⁶⁵ and men of that Stamp were conservatives. They are now co-operating with the leading liberals bankers and merchants to defeat this measure.

4. You seemed to think that four millions of people would make a respectable nation and that fear of taxation would keep us from joining the United States. But balance this matter fairly and you will see that our only chance of remaining British is to preserve our old institutions and stay within the Empire. You would not take a Ten Gun Brig into action against an Eighty Gun Ship and you would be dismissed the service, for wasting men's lives, if you did. Yet it seems to be thought fair to launch us into a hopeless national life that England, by the sacrifice, may buy her peace with the Republic. When this is done do not call us Cowards if we refuse to fight and do not suppose, for a moment, that fear of American taxation will ever induce us to attempt to maintain a position in which we must be crushed and financially ruined by three months of war. I am a dear lover of old England and to save her would blow Nova Scotia into the air or scuttle her like an old ship. But when driven out of the Empire, absolved from my allegiance, and told that the Mother Country will run no risk to maintain old relations, how can it be supposed that when a peaceful frontier and full fraternity with a great British Community, who have an army and navy and are afraid of nobody, are offered to me that I would be such an

⁶² He contributed a series of letters to the *Morning Chronicle*, Halifax, in January, 1865, entitled "The Botheration Scheme." See also his letter to Lord John Russell, January 19, 1865, *Speeches*, II.

⁶³ He was then Fishery Commissioner for the Imperial Government.

⁶⁴ Sir William Fenwick Williams in Nova Scotia; Arthur Hamilton Gordon in New Brunswick. Gordon was a son of the Earl of Aberdeen. Both were acting under instructions from the Imperial Government. Pope, *Memoirs*, I, 298.

^{64a} Enos Collins was born about 1776; had stirring adventures as a privateersman; made a fortune in New York real estate; added to it in Nova Scotia; and died about 1870.

⁶⁵ Mather Byles Almon. Delegate for Nova Scotia with James W. Johnston, James B. Uniacke, and William Young, to confer with Lord Durham at Quebec in 1838. Appointed to Executive and Legislative Councils, 1843. He was still a member of the Legislative Council in 1866. Andrew M. Uniacke represented Halifax in N. S. Legislature in 1845. Alfred Gilpin Jones (1824-1906) represented Halifax in the House of Commons 1867-72, 1874-78; 1887-91, Minister of Militia, 1878; Lieutenant-Governor Nova Scotia, 1900-6.

idiot as to embark in this crazy Confederacy with a mongrel crew half French and half English and certain to be sent to the bottom at the first broadside.

With an enormous amount of shipping at sea Nova Scotia must belong to a great Naval Power. When England throws her off her destiny is inevitable, and nobody with the eye of a statesman in his head, can suppose that she will choose Ottawa for a Capital when she has lost London and can have New York, no further off than Ottawa; or that, with the Arsenals and Dockyards of Boston and Portsmouth at her very doors, she will commit the care of her commerce to the Canadians who have one paltry steamer in the Gulf in Summer and are frozen up for half the year. We go in for the Empire one and indivisible but when the old ship is broken up we are not such fools as to trust our lives in a crazy craft in which we are certain to be drowned.⁶⁶

You kindly offer to bring Lord Carnarvon and I together. If you do we shall not talk Confederation, as it was arranged that we should not, till after the Canadians had arrived; and besides his Lordship is the best judge of when we should meet or whether we should meet at all. So far as I can discover, by his published speeches, Lord Carnarvon is dealing frankly and circumspectly with the subject, and if he does his duty by the Provinces I shall give him credit for it, even if I should never add the light of his countenance to my pleasant recollections of English social life.

Believe me my dear Sir John,

Sincerely yours,
JOSEPH HOWE.

Private.

London,
25 Saville Row
Nov. 22, 1866.

The Most Honorable

The Marquis of Normanby.

My dear Lord Normanby⁶⁷

I have read your letter, with the care and interest it naturally challenges from an old friend who will ever attach great weight to your Lordship's opinions on any subject. Perhaps you will pardon me for troubling you with a few observations in reply.

1. Any attempt to improve the Quebec Scheme was, from the first, opposed by all the parties who prepared it. In Canada, the Ministry refused to allow it to be debated or amended, clause by clause—Carried it en bloc and declined to submit it to the constituencies.⁶⁸ As late as the 27th of July last, the Ministers and their supporters, as you will see by the extract given in Mr. Annand's pamphlet, declared that it should be rigidly adhered to.

In New Brunswick, Mr. Tilly took the same line and only changed his tone when the scheme was rejected.

In Nova Scotia, the Delegates attempted to bully every body who offered criticisms or improvements, and when I resented the attempt to make our people

⁶⁶ For some reason—he may have made himself believe it at the time—Howe's arguments against Confederation seem to rest on the extraordinary idea that union of the colonies involved dis-union of the Empire.

⁶⁷ Second Marquis of Normanby (1819–1890).

⁶⁸ Macdonald wrote Tilley, October 8th, 1866, "It was agreed at Quebec that the resolutions then agreed to should be submitted by the several governments to their respective legislatures at the then next session, and if possible carried *en bloc*, and without alteration lest any chance should create the necessity for a new conference. Canada carried the resolutions according to promise." Pope, *Memoirs*, I, 305. See also *Debates on Confederation*, 15; Bourinot, *Canada under British Rule*, 210–11.

believe that I approved of the policy, they attempted to silence or coerce me by threats of the Queen's displeasure, if I dared to express an independent opinion. Compelled to think and act for myself I took the ground on which I now stand,—*that any scheme forced upon the Provinces, by an arbitrary act of Parliament, must be a failure, and that the first condition of Success for any plan of government must be its deliberate acceptance by the populations whose Institutions it was proposed to change.*

As matters stand, of four millions in the five provinces, but four hundred thousand have had an opportunity to express their opinions. Of these, a hundred and fifty thousand had decided against,⁶⁹ and two hundred and fifty thousand once for and once against.⁷⁰ When left to their own judgment the latter were opposed. When a partizan Governor⁷¹ had overthrown the Cabinet and used and abused the Queen's name, while the Fenians were on the frontier, a decision in favour of some sort of Union, which nobody understood, was obtained—which really is not worth a rush. The reaction was pretty prompt, and when Mr. Gordon left the Province there was hardly any body to see him off or say God bless him.

An attempt is now being made to buy the Constituencies of P. E. Island, by an offer of two hundred thousand pounds to purchase out the proprietors.⁷² If the people of the Island chose to do this with their own money I can see no objection to it, but the offer to purchase their vote in favor of Confederation, is characteristic of the corrupt and unscrupulous spirit which Canadian politicians have infused into the whole transaction. When Parliament has taken the money of Nova Scotia and New Brunswick to purchase and distribute the lands of P. E. Island how can they refuse Mr. Bright's proposition to buy up the large Estates in Ireland, and when that is done why should not the large Estates in England be bought up and distributed among the Tenant Farmers?

2. At present the Colonies *enjoy self government and belong to the greatest confederacy that the world ever Saw.* This Scheme reverses the policy of the Colonial office, for a quarter of a century so successful. It transfers to John McDonald or Darcy McGee, resting upon a purely Canadian majority, powers which no Colonial Secretary ever claimed. When Downing Street appointed our Governors and controlled our casual revenues, they rarely interfered with inferior patronage, could levy no new taxes, and the casual Revenue seldom exceeded £10 or £12,000. The Downing Street at Ottawa will appoint our Governors, Councillors, and Judges,—will have unlimited powers of external and internal taxation—At the start, will con-

⁶⁹ The electors of Prince Edward Island had voted overwhelmingly against Confederation. The P. E. I. Assembly in 1866 resolved that: "This House cannot admit that a Federal union of the North American provinces and Colonies which would include Prince Edward's Island, could ever be accomplished on terms that would prove advantageous to the interests and well-being of the people of this island, separated, as it is and must ever remain, from the neighbouring provinces by an immovable barrier of ice for many months in the year." In March, 1866, the Assembly of Newfoundland adopted the following Resolution: "That while duly regardful of the momentous character of the subject and of the promise to His Excellency to give it attention, yet as no information has been received demanding its immediate reconsideration, the House does not deem it expedient to enter upon its discussion with a view to any decision thereon."

⁷⁰ Refers to the two New Brunswick elections, in 1865 and 1866. The *St. John Telegraph* published a statement showing that the N. B. elections of 1866 resulted in 55,665 votes for and 33,767 against Confederation. Hannay, *New Brunswick*, II, 254. The resolution in the Assembly for the appointment of delegates was adopted by a vote of 30 to 8.

⁷¹ Arthur Hamilton Gordon.

⁷² The offer of \$800,000 to extinguish proprietary rights was made by the Confederation delegates to Mr. James C. Pope, Leader of the Prince Edward Island Government, who happened to be in London at the time. Pope, *Memoirs*, II, 146-7. Pope had already published his views on the subject of Confederation. See Bibliography No. 62.

trol and dispense a surplus revenue, drawn from Nova Scotia alone, of £234,000 or nearly twenty times the highest amount that the Colonial Secretary ever dispensed. And besides Downing Street never took a pound out of the Country. If sometimes lavishly expended, the Casual revenue was all spent in the Country which raised it, but the Finance Minister of Canada may, annually, draw out of Nova Scotia an enormous sum and spend it where he likes. That our nineteen members will afford us any protection it is in vain to hope.⁷³

The modern history of Canada warns us what is coming when our revenues are transferred to those who have earned so unenviable a reputation in the distribution of their own.

3. Just now, my plan for the Organization of the Empire may seem visionary and impracticable, because there is nobody who will grapple with the question of how it is to be kept together and defended. But I can afford to wait. All I hope now is to set people thinking in the right direction. We should all go for the Empire, one and indivisible, as opposed to the policy of dismemberment. If my plan is not the best let us have a better, but let us all work and think in the right direction.

I say I can afford to wait. Responsible Government was denounced as visionary in the House of Commons, and voted down by resolutions, long after we had recommended it, in North America, as the key to a sound Colonial policy.

In 1838, Crane of New Brunswick and myself memorialized Her Majesty's Government to subsidize and Establish lines of ocean Steamers.⁷⁴ The policy was adopted and our great lines now connecting these Islands with all the world are the result.

In 1851 I advised Systematic and regulated plantation of the poor, in our own provinces, in connection with the construction of Public Works.⁷⁵ This was not done. In fifteen years, nearly two millions of British Subjects have been allowed to drift into the United States, to become Fenians and Enemies, and one fourth of them have been killed or wounded in the American Civil War. The poor rates consume about 7,000,000 per annum, and the questions of poverty and crime still press upon every body's thoughts; and, besides, Ten Millions of British Capital, which need not have been risked at all, have been hopelessly thrown away on Canadian Railroads. My policy was thrown aside and this is what came of Canadian schemes and contrivances.

In 1855 I sent to the Secretary of War a breech loading Rifle, out of which I could fire nine shots per minute, while an expert could fire 12. My letter was never answered. Breech Loaders were considered "Visionary." I then implored Sir Gaspard Le Marchant⁷⁶ to use his influence to have these guns adopted. The answer was unfavourable. We went through the Indian Mutiny and several Small wars without them, and it was only when the Austrian Empire went down before the Breech loaders that any body here would think out of the old departmental grooves.

So it will be with this Imperial policy. Having thought for ten years upon it I know I am right. My interests are all the other way. There is no position in this Confederacy, if it is formed, that I cannot win. There is none that would not

⁷³ A rather remarkable argument, coming from the champion of responsible government. Compare his letter to Francis Hincks on the Organization of the Empire. *Speeches*, II, 311-27. It seems incredible that Howe could have expected a well-informed English statesman to swallow such an obvious fallacy.

⁷⁴ *Speeches*, I, 188-91. William Crane, was a member of the New Brunswick Government in 1840.

⁷⁵ *Speeches*, II, 132, *et seq.*

⁷⁶ Sir John Gaspard Le Marchant (1803-1874). He was Lieutenant-Governor of Nova Scotia in 1855.

be given to me tomorrow if I would degrade myself by abandoning the path of duty,⁷⁷ but I believe that the honor of the Crown and diffusion of British Civilization can only be secured, for any long period, by preserving the Unity of the Empire. When we begin to break it up where are we to stop? And what will the fragments be? Republics and nothing else.

Does it never occur to you, My Lord, that now by our Colonial System, as it stands, we are diffusing all over the world respect for Monarchical principles of Government, for British Order, usages, and laws. But, whenever the Colonies are formed into new Nations, the old ties will be severed,⁷⁸ the old respect for mixed classes and orders will die out, and that having within themselves neither kings nor Peers the respect for both will give place to the contempt and opposition to their existence any where, so prevalent in the United States. To me it is apparent that all the fragments broken off the Empire must be Republics. How will it stand with England when all the English Speaking people, outside these two Small Islands, are Republicans, in close Sympathy with the millions of Democrats who are rising pretty near the Surface here, just now. Pray think of all this, My Lord, before it is too late, and let us get upon some more solid ground than this Catamaran of a Confederacy, which even if successful as a British American measure, gives us no policy for the Empire.

I admit that our Colonial Legislatures might be improved, and they will improve as Population and wealth increase. Your Lordship may remember what the Parliament of England was, in Walpoles time, when "every man had his price," and that a good many Vulgar and ignorant people get into the House of Commons now, and that all the corruption and fraud, ever brought to the surface in all our small Parliaments, since their origin, are as nothing when compared to the huge delinquencies charged, at this moment, on a single Railway Contractor in the Imperial Parliament. We have had Scenes not creditable in our House, but have we ever had any so disgraceful as those, described in late Canadian papers, where Ministers of the Crown were day after day rolling drunk in their seats, and another in which a Mr. Chambers⁷⁹ was assailed by pamphlets and other Missiles flung in his face, while trying to address the Speaker, during the last session of the Ottawa Parliament. Depend upon it our manners will not be much improved by association with Canadian politicians.

As to British America being able to stand alone, while the United States hold together, that idea may as well be dismissed from all our minds. I have bet four

⁷⁷ A little over two years later Howe accepted a seat in the Government of Sir John Macdonald.

⁷⁸ In this and other similar statements, Howe, as elsewhere noted, seems to have been possessed of the idea that Confederation implied separation from the Empire. It is true that this idea was more or less openly expressed by many English politicians and writers of the period. Even such a far-seeing Colonial as Haliburton wrote of the Federal Union proposed by Lord Durham: "Most people think, and all reflecting men know, it would ripen the colonies into premature independence in less than ten years." *Bubbles of Canada* (1839) 253. And yet Howe himself had been able to see on previous occasions that Confederation was a logical step toward that Imperial Federation which he had so much at heart. Had he lived half a century later he would probably have accepted unreservedly these words of a later Imperialist, Viscount Milner: "In answer to those who hold that the growth of that Canadian spirit of Canadian patriotism in which I rejoice is incompatible with the Imperial idea, I try to point out how decisively the history of this country (Canada) itself belies such fears. There are no greater contrasts within the British Empire to-day, or at any rate within the self-governing states, than existed in Canada before Confederation and indeed still exist. You had physical distances and inaccessibility. Nova Scotia is farther from British Columbia than from Great Britain, and the then unbridged prairies and Rocky Mountains were out and away a greater obstacle to intercourse than the Atlantic Ocean. You had likewise differences of race. But in spite of all this United Canada is a great accomplished fact to-day. And it has become so without loss of individuality in the several and very diverse states which compose it, and without violence being done to their distinctive character and traditions." *Speeches in Canada*, 15-16.

⁷⁹ F. H. Chambers, Member for Brockville. He took part in the Debate on Confederation in 1865. *Confederation Debates*, 770-75.

baskets of Champagne—one that Confederation will not be carried—another that, if it should be carried, in a Year after we shall elect our own President and send our Minister to Washington—and two that, in less than five Years after this new Nationality is set up, the frontier will be rubbed out, and British America will be incorporated with the Republic. I hope Sincerely that I may win the first but, if not, I am sure to win the other two.⁸⁰

But assuming the Policy of Confederation to be sound surely I cannot be mistaken in this that the measure ought to be perfect, in all its parts, before any ministry should be asked to sanction it, or present it to the Imperial Parliament.

If the Quebec Scheme be modified, the Parliament of Canada must accept the modifications, and, as up to this moment, not one of the Maritime Provinces has arranged the local Institutions under which they are to live, when those they have are swept away, is it too much to ask that this work shall be done and that the Scheme shall be presented perfect in all its details, before there is any attempt at Imperial Legislation. But, besides, why should there be haste? When, by law, the people of Canada and Nova Scotia will, next summer, have an opportunity to pronounce their opinions, would it not be a most unprecedented and extraordinary thing for the Imperial Parliament to deny them this privilege, and would not such an arbitrary act engender bitter feelings of resentment, and go far to accumulate obstacles to the working even of a good measure. You do not sanction a Railway or Turnpike without an investigation by Committee. Would You overthrow the Institutions and transfer the Revenues of four great Provinces without exhausting the ordinary means of investigation, which you consider indispensable to the security of inferior interests.

The whole subject of Colonial policy and defence should be referred to a mixed Commission of Military and Naval officers and Civilians. A report, founded on evidence, carefully collected by such a commission, would be of great authority and high Value, and I think, My Lord, that you will, upon reflection, so far modify your opinions as to recommend this dignified and safe course.⁸¹

Believe me, my dear Lord Normanby,

Sincerely Yours,
JOSEPH HOWE.

London,
25 Saville Row,
Nov. 23, 1866.

Wm. J. Stairs, Esq.

My dear Stairs,

I have been for sometime satisfied that something confidentially communicated to you was known to the Delegates here, and that the knowledge had been used against us. I was very much surprized to learn, in conversation with Mr. Garvie⁸² that copies of my letters had been allowed to go out of your possession. I trust this will not occur again. You have no idea of the delicacy and secrecy required in conducting such operations as we are engaged in, and how much mischief may be done by the slightest imprudence. I have thought it due to you all that you should be kept regularly informed of the progress of affairs but I must make my reports very brief and general unless assured that they will be confined to the smallest number of persons and never go out of your hands.

⁸⁰ There is no record as to who got the champagne. It certainly was not Howe.

⁸¹ Howe's object in this suggestion of a Commission was obviously to shelve the Confederation scheme for at least a couple of years. See his letter to Stairs of November 9th.

⁸² William Garvie. He was in London on private business.

The situation has not much changed since last mail, certainly not for the worse. Annand's Pamphlet has rubbed out Tupper's case, and mine on the Organization of the Empire is attracting a good deal of attention. You will find in the Pall Mall Gazette⁸³, which circulates much among the higher classes and all over London, a very handsome notice of it, while my old friend the Hampshire Independent which goes all over the Southern Counties gives us a brave lift in a series of articles.

You will find in the Examiner two Capital letters from Montreal and in Public Opinion of to-day a rather pointed article copied from the Montreal Herald.⁸⁴

You will see in the papers notices of the dinner given to Mr. Verdon^{84a} of Victoria. Before leaving he wrote to me to say that he entirely approved of my views. He had been staying some days with Earl Carnarvon. In the Times, Telegraph and other leading papers, though the Pamphlet has not been directly referred to it is evident that they have suddenly awakened to a conviction that something more than Confederation is wanted.

Of Mr. Hamilton's Pamphlet⁸⁵ I shall probably take no notice, as I presume he has been sufficiently answered by Annand.

The Memorial from Lower Canada⁸⁶ is spirited, able and will do good. You will find the substance of it in the Daily News and other papers.

One of the objects I had in view in the second Pamphlet was to show that something broader and more National than Confederation was wanted—to thus draw attention off to the greater subject, and if possible to get the whole question of Colonial policy and defence referred to a Commission of Military and Naval Officers and Civilians, or to a Parliamentary Committee. It has been suggested through two or three highly influential quarters that this would be the best solution of the difficulties.

Believe me,
Yours Very truly,
JOSEPH HOWE.

25 Saville Row,
London, December 8, 1866.

Wm. J. Stairs, Esq.
My dear Stairs,

Mr. McDonald⁸⁷ arrived by the last boat, and joined us on Saturday night. He has taken a room in this house so we are all together which gives greater facilities for work and consultation than we should have if scattered about the town. Garvie has been with us until a few days ago, but has taken a lodging nearer to Lincoln's Inn, and to the lectures he has to attend.

The Delegates whose wives are here have taken a house in Oxford Terrace, and live I believe, together—the rest remain at the Alexandra. The Canadians have

⁸³ Founded in 1865. Independent Liberal. Edited by Frederick Greenwood. One of its early contributors was Anthony Trollope.

⁸⁴ Established 1811. Edited by Edward Goff Penny in 1866. The following year Penny published a pamphlet against Confederation. See Bibliography No. 73.

^{84a} Referred to in his letter of Nov. 9 as the Receiver General of Victoria.

⁸⁵ See Bibliography No. 56.

⁸⁶ See Bibliography No. 53. The opponents of Confederation in Canada East were also making themselves heard in the Canadian Legislature. Dorion, in his speech on March 6, 1865, pointed out that "petitions with more than twenty thousand signatures attached to them have already been presented to this House against the scheme of confederation." Boyd, *Cartier*, 246.

⁸⁷ Hugh McDonald. He had followed Howe and Annand to London.

taken rooms at the Westminster Palace Hotel, and the Archbishop⁸⁸ has a lodging in Charles Street. This is the position of the two hostile camps.

The operations of the fortnight have not been very decisive. For a week every body thought and talked and wrote of little else than the monster procession of Working People who were expected to march through London.⁸⁹ As I know that the two armies who marched through Washington took two days of seven hours each, and being 60 files deep, and less than 200,000 men, I felt some curiosity to see how 250,000 marching six abreast, were to get through London in one day. Fortunately no such numbers came. The procession marched past the point from which McDonald and I saw it in something over an hour and a half, so that there could not have been more than 20 or 25,000. Of course great crowds of people turned out to see the show but everything passed off in an orderly manner, which was a great relief to every body.

There have been rumors of a split in the Cabinet but they have been contradicted in the Standard by authority. It is not yet known whether there is or is not to be a Reform Bill.⁹⁰

The state of Ireland gives a good deal of uneasiness. Troops are pouring in, and Ships of War watch the sea coast. Last year it was assumed that Fenianism was confined to a very small class. It seems now to be admitted that sympathy with the movement is very wide spread.⁹¹

I met Henry, Mitchell, Ritchey and Fisher⁹² at a Festival given by the Scottish Hospital Association on the 30th Nov. The dinner, the loyal and National toasts and ordinary business of the Society, occupied the time till past 11. At the request of the Chairman I then gave one of their annual toasts "Scottish Literature," and, without touching the subject of Confederation, wove into a speech of half an hour pictures of the Empire as a whole and of Nova Scotia in particular, all calculated to impress the idea that organization and not dismemberment should be the policy. Of course I did my best—how it was done Annand may give you some account. The Chairman and Lord Elcho⁹³ came personally to congratulate me, and to invite me to their houses. I go to the seat of Lord Overstone⁹⁴ with Colonel Lyndsay⁹⁵ on the 17th, and shall cultivate the acquaintance of Lord Elcho too as both are Members of Parliament. All the reporters had left before I rose, but the one on the Standard. You will see what he says of the speech. There are so many of these Dinners in London that the practice of the Press is to condemn them into a short space. In this case that was done by the only reporter who remained. About 12 "Our Colonial Guests" was given from the chair. We all stood up, and of course as I had said my say, we left the speaking to the other fellows. Before Peter Mitchell had spoken ten minutes half the Company dispersed. Henry followed in his lumbering way, and soon cleared the room. Ritchey appearing to be very much mortified and annoyed. We stood till Henry was done, and when Fisher rose as there were only

⁸⁸ Thomas Connolly, Archbishop of Halifax (1814-1876). He was a warm personal friend of D'Arcy McGee, and a strong supporter of Confederation.

⁸⁹ See "The Reform Agitation," in McCarthy, *History of Our Own Times*, ch. 51.

⁹⁰ Gladstone had introduced his Reform Bill in March of this year. His Government was defeated in June. Disraeli's Reform Bill was not brought down until February, 1867, and passed in August.

⁹¹ The Fenian Rebellion did not break out until February, 1867. It was finally crushed in March. McCarthy, *History of Our Own Times*, ch. 53.

⁹² See Note 1.

⁹³ Afterwards Earl of Wemyss.

⁹⁴ Samuel Jones Loyd, Baron Overstone (1796-1883) economist and financier. Had been Whig member for Hythe; raised to peerage, 1850.

⁹⁵ Charles H. Lindsay, born 1815. Entered the Army 1835. Served in the Crimea. Elected for Abingdon, 1865. A Liberal-Conservative.

a dozen or two left at the table, we went off with the rest to have our Coffee and a Cigar. Even if it had been worth while to answer anything they said there was nobody reporting and no audience. We were content to let the Scotchmen draw the contrast between the two sides without disturbing the harmony of a benevolent and convivial meeting by the intrusion of our Colonial politics. This is a picture of the scene as Annand and I saw it. Of course I had not the bad taste to write out my speech and publish it on my own account. Our friends were not content to have their light hid under a bushel, and by this mail you will receive the *Canadian News* for which they have written out all they said and much that they did not say, with an editorial attributing to Lord Elcho, Colonel Lyndsay, and Dr. McKay, sentiments and opinions which none of them ever uttered. All this is mean and contemptible enough. My speech has been omitted altogether. We shall put the affair right on this side of the water and our papers must do the same on the other.

On Tuesday the Confederates got to work. Galt and Tilly and I suppose Archibald were yesterday engaged on a Finance Committee, from which we infer that in view of the increasing revenues of Nova Scotia and New Brunswick both Tilly and Tupper feel the necessity for having the 80 cents increased.⁹⁶ We hear, indirectly that the Canadians are prepared to make modifications but to what extent remains to be seen. Of course until they have agreed upon something we have nothing to attack, but we keep, through every channel that we can occupy, operating in the meantime on public opinion.

You will receive by this mail the *Hampshire Independent* with a friendly article on the Organization—Lloyd's Weekly which has a circulation of half a million a week with a condensed statement of our case by Annand—the *Morning Post*⁹⁷ in which Garvie has broken good ground and the *Weekly Despatch*⁹⁸ of this morning in which there is an admirable article, written by the Senior Editor, with whom Annand and I spent an hour last week. We are promised the insertion of articles, already written for the *Telegraph* and *Spectator*.

We also send you the *Saturday Review*⁹⁹ which has an article against us but even that paper is assuming a more moderate tone. The *Globe*¹⁰⁰ has an article in favor of Confederation, but the Editor admitted in a conversation with Annand that no Cabinet could bring down a measure that had not been sanctioned at least by the Colonial Legislatures.

⁹⁶ "An increased subsidy, in addition to the 80 cents per head, of \$80,000, \$70,000, \$60,000, and \$50,000 was made severally to Upper Canada, Lower Canada, Nova Scotia and New Brunswick, and the capitation subsidy of 80 cents in both New Brunswick and Nova Scotia extended until the population reached 400,000." Gray. *Confederation*, 386. In January, 1869, Howe himself secured for Nova Scotia, by the so-called Better Terms Arrangement, a substantial addition to the amount provided by the B. N. A. Act. *Speeches*, II, 583, *et seq.*

⁹⁷ Established 1772. Southey, Lamb, Coleridge, and Wordsworth were among its contributors in the early part of the last century. Algernon Borthwick, afterwards Lord Glenesk, was editor from 1852 to 1898.

⁹⁸ Founded 1801 by John Bell. Edited by William Johnson Fox for many years. Acquired in 1875 by Ashton Wentworth Dilke. Radical in politics.

⁹⁹ Founded 1855. John Douglas Cooke first editor, 1855-68. Succeeded by Philip Harwood. Among its more notable contributors were Andrew Lang, John Morley, E. A. Freeman, William Vernon Harcourt, and Lord Robert Cecil, afterward Lord Salisbury. In its early years the *Saturday Review* made it its business to systematically attack *The Times*.

¹⁰⁰ Established 1803. George Lane was first editor. In 1823 the *Globe* absorbed the *Traveler*, and Walter Coulson became editor. Succeeded by Gibbons Merle. Started as a Whig paper, but turned Conservative after 1869.

A question, not raised by us, but one which is calculated to have an important bearing on our affairs, has arisen out of the Lamerand Case.¹⁰¹ You will see in the Times of yesterday and in the Star of this morning, articles in which Cartier is accused of Conspiring with the Bank of France and the Grand Trunk Officials to deceive Lord Monk and violate British Law. The language used is of unusual severity. This is rather a hot welcome for the little Frenchman on his arrival here. What is to come out of all this we cannot yet tell, but it is a serious thing to be charged with "infamous" conduct by the leading journals of this great metropolis.

We shall probably reopen communication with Carnarvon early next week. He may not wish to do this till the Delegates have formally presented their scheme, but we shall let him know that we are on hand.

Annand has not been very well for a few days and will not probably write much. He is much better and he, McDonald & Garvie send kind regards to all our friends.

Believe me,
Yours truly,
JOSEPH HOWE.

London,

Dec. 21, 1866.

William J. Stairs, Esq.

My dear Stairs,

On the 10th instant I addressed to Lord Carnarvon's Private Secretary the Letter a copy of which is enclosed. His Lordship was out of town but a few days after we received an answer through Sir Frederick Rogers¹⁰² which is also enclosed. We of course kept the appointment, and His Lordship came to town to meet us. Nothing could be more gracious and kindly than our reception. There was no asking for credentials or exceptions taken to our position. We had already presented our credentials to the people of England and our position, fairly won, could not be ignored, even had the disposition existed, which I am quite sure it did not.

We discussed the subject with His Lordship in presence of Sir Frederick Rogers, the Permanent Under Secretary for an hour and a half. As we had been nearly six months thinking of little else you may be sure that we condensed into that hour and a half as vividly as we could all the main points of our case. We did our best. McDonald's presence, representing a large interest, and being able to speak for the Eastern Counties was timely and very useful.¹⁰³

Before leaving he gave me permission to send him two long private letters which had been addressed to persons in high positions here, and in which a good many new views had been presented with the utmost freedom. These have been enclosed this morning with a note intimating that when the Confederates have completed their Act of Parliament we shall be prepared to review it and perhaps to suggest some safe and easy solution of existing complications.

¹⁰¹ Lamorand, a criminal, had fled to Canada from France. His extradition had been demanded, and Cartier was interested in the case as Attorney General.

¹⁰² Afterwards Baron Blachford (1811-1899). Permanent Under Secretary of State for the Colonies, 1860-71.

¹⁰³ Hugh McDonald sat for Inverness County in the N. S. Legislature, and in a general way represented the interests of Cape Breton.

Earl Carnarvon gave us distinctly to understand, that, as yet no measure had been prepared or presented. In fact that nothing had been done, and that it was not likely that any thing would be until after the Christmas Holidays.¹⁰⁴

This interview came very opportunely, as it enabled us to contradict another lying financial puff which the Grand Trunk people or some of the Delegates had palmed off on the *Daily News* and gave the answer to McCully who had labored in his pamphlet, recently published,¹⁰⁵ to persuade the government and public that we had no official standing that could be recognized.

Mac's Pamphlet is not very formidable. All that is worth notice will probably be answered by McDonald.

You will find in the *London Sun*¹⁰⁶ of the 12th and 19th, elaborate articles on Organization and a friendly notice of the Pamphlet in the *Athenaeum*. It is not likely that any body will think of anything but Plumb Puddings and Pantomimes for the next ten days, but we shall still work on and let no occasion slip to put in a word in season.

McDonald and I dined with the Royal London Yacht Club on the 10th. They placed us next the Chair and asked me to propose the Press. The reporters had gone before my time came but I made what they were pleased to call the speech of the evening. The Sheriffs of London who sat on the other side of the Chairman complimented me highly and asked me to dine at the Old Baily this week to meet the Judges, an invitation which I had to decline with all others this week in consequence of inflammation of the eyes. I am getting better, and hope soon to be all right.

Wishing you all a merry Christmas, I remain,

Very truly Yours,
JOSEPH HOWE.

25 Saville Row,
Dec. 10, 1866.

Cyril C. Graham,¹⁰⁷ Esq.
Sir,

Will you be kind enough to acquaint the Earl of Carnarvon that Hugh McDonald Esq., came over by the last boat delegated to aid Mr. Annand and myself in representing to Her Majesty's Ministers the views of those who desire that no measure shall be sanctioned by The Imperial Government for changing the relations of the North American Provinces to each other and to the Mother Country which has not been submitted to and accepted by the populations whose highest interests it may involve.

Though Mr. Annand and myself have been detained in this country nearly five months by the failure of the Canadian Delegates to appear we have felt that the Colonial Secretary was in no condition to enter officially upon the object of our mission until those gentlemen had arrived. The papers inform us that delegates from three of the Provinces are now sitting in conference and are in communication with the Colonial Office. We are therefore naturally desirous to learn when Earl Carnar-

¹⁰⁴ The London Conference opened in the Westminster Palace Hotel on Tuesday, Dec. 4th. The delegates considered the Quebec Resolutions, with intervals, from the 4th to the 24th. On the latter date a series of Resolutions were adopted. The first draft of the Confederation Bill was adopted Jan. 23rd, 1867. The Bill in its final form was adopted March 29th, 1867. Pope, *Confederation Documents*.

¹⁰⁵ See Bibliography No. 86.

¹⁰⁶ Founded 1792. At first violently Tory, but turned Whig about 1825.

¹⁰⁷ Lord Carnarvon's Private Secretary.

von thinks it probable that he can receive us and permit us to submit the views of those we represent.

We have no wish to press prematurely for an interview or to involve His Lordship in any irregular discussion but would be very glad to know if His Lordship is able to inform us at what time we ought to be in town.

I have the honor to be Sir,
Your very obedient servant,
JOSEPH HOWE.

Downing Street,
14th December, 1866.

Honble. Joseph Howe.
Sir,

With reference to your letter dated the 10th Instant I am directed by the Earl of Carnarvon to inform you that His Lordship will be ready to receive you together with Mr. Annand and Mr. McDonald at his office on Tuesday next the 18th Instant at 12.30.

I am to add that if that day be not convenient to you, Lord Carnarvon will be happy to receive you after Christmas.

I am Sir,
Your obedient Servant,
FREDERICK ROGERS.

London,
25 Saville Row,
Jany. 5, 1867.

Wm. J. Stairs, Esq.
My dear Stairs,

I have but a short report to make. During the Christmas Holidays every body who has friends or a home to go to gets out of town and business is not expected to be resumed till Twelfth Night is over. I spent my Christmas with Lord Overstone, but was too ill to enjoy it much, my bronchial tubes were stuffed with cold and my voice completely gone. I am now all right again, but for five or six weeks have suffered a good deal with cold and inflammation of the eyes, very much aggravated by the dense atmosphere and darkness of London. I am writing now (12 oclock) by gas light and although the frost is unusually severe, the atmosphere is dense and heavy. Keeping one's eyes and throat all right under such conditions is no easy task, but by simple remedies to which I am accustomed, I am now quite well again without the necessity of calling in the Doctor.

I wrote you that I had, after our interview, sent to Earl Carnarvon two long private letters which had been prepared for others but bore strongly on the question¹⁰⁸ His acknowledgement of this communication, written after he had read the letters, was very kind and complimentary. This gave an opening for another note which I addressed to him on New Year's Day. This reached him at his Country Seat where he was ill, but was acknowledged in very kind language. He is to communicate with me again, which I presume he will do either when he comes to town on the 7th or after the Cabinet Meeting which is announced for the 8th.

¹⁰⁸ This is the letter to Carnarvon referred to in his letter to Stairs of Oct. 12th, the concluding page of which is missing. See Note 48.

The Delegates, it is said, have prepared their scheme, and it was announced in the *Canada News* that Earl Carnarvon had directed a Bill to be prepared. This cannot be true for we know that the three Attornies General were at work at the Bill yesterday at the Alexandra. If done by the Imperial Government the English Crown Officers would prepare it. So matters rest, but it is satisfactory to know that they are approaching a crisis, and that we cannot be kept much longer in suspense. It is six months, today, since I left home, and as you may easily conceive I often weary to see it again. This is no time for such thoughts, however, and I put them aside. I cannot desert my post till the fight is over.

Mr. Annand, and Mr. McDonald are both well and actively and usefully employed every day at something that aids the good cause. Garvie is doing us good service as a volunteer, and his ready pen tells where he gets an opening.

It is satisfactory to know that the public mind is waking up in a manner before unknown here, in respect to Colonial subjects generally, and the consolidation and defence of the Empire in particular whatever Mr. Archibald and Dr. Tupper may say the broad views propounded by your Delegates are meeting with very general favor.

You will find that Colburn's *New Monthly*¹⁰⁹ has an article of 15 pages. The writer favors Confederation but admits that the Colonies should not be coerced and goes strongly for Organization. The new *Imperial Review* (the new organ of the Conservatives, got up in opposition to the *Saturday Reviler*, as Bright called it) has a long and excellent article on the Consolidation of the Empire. The *Independent* gives a column to British America, taking our side. Annand will send you the *Examiner* in which a good article, written by him, also appears. The *Spectator* has a spirited article against us but it is followed by a solid one on our side. So the war rages, and there being only four Needle guns on our side to eighteen on the other, we contrive to return their fire pretty well.

The *Canadian News* contains a sort of rehash of the Quebec Resolutions, which it was at first assumed were those adapted by the Conference. This was an error. The same paper announces that the Lord Mayor will entertain the Delegates. He could do no less without being inhospitable. Do not let these things frighten you. Watkin¹¹⁰ has been active and in communication with the Mayor about the Quebec Subscription and the dinner comes of his suggestions no doubt.

Parliament meets on the 5th Feb. A series of Cabinet Councils will be held in the meantime and we shall soon learn something of the Ministerial programme.

The day after New Year we had a fall of snow covering London and the country for miles around to the depth of eight inches. The weather has been since severely cold. Yesterday it was said to be 10 below zero. The Railroads every where were much impeded. On the evening of the 2d no omnibus or Cab could be got. There were not 20 Sleighs in all London and you can imagine the difficulty with which its immense traffic has been carried on upon wheels during the week. The weather is still cold, with no signs of a thaw.

Wishing you all many happy returns of the gay season that will be past before this reaches you I am ever

Sincerely Yours
JOSEPH HOWE.

See Letter and Article in today's *Spectator*. Also article on "political positivism" in *Imperial Review* as an indication of the Colonial policy of the present Cabinet.

¹⁰⁹ The *New Monthly Magazine* was established by Henry Colburn, a London publisher, in 1814.

¹¹⁰ Sir Edwin William Watkin, Bart. (1819-1901) Represented Yarmouth in the Imperial Parliament. President of the Grand Trunk Railway, 1862-68, and financially interested in several of the English railways.

London,
25 Saville Row,
Jany. 19, 1867.

Wm. J. Stairs, Esq.

My dear Stairs,

Your letter, by the last mail, came to hand, and the Petitions, which were welcome, all right.

We are now approaching a crisis, and within the next fortnight the question must be determined, so far as the action of the Government is concerned.

As soon as the last Mail had gone I went down to Gravesend to prepare our case. Before going Annand, McDonald, Garvie and myself held a Council of war, and came to these conclusions that, whether with a view to stagger and convince the Ministry or to instruct Parliament should the question go before the two Houses, our paper should be elaborate, covering the whole ground and contain within itself a full argument of the case. It was also determined to arrange the topics under different heads, for easier reference, and to relieve the heaviness of a long paper.

Taking with me what material had been accumulating, and every body's suggestions, I went down to Gravesend where I shut myself up for ten days, Sending forward to our friends, everyday, for revision and correction, the MS. as it was produced. They scanned it carefully and meanwhile were engaged in preparing the Appendices. I came up on Thursday night, as you may suppose weary enough, as I had scarcely walked a mile or been in the air an hour in the ten days. The whole affair is now in the hands of the Scrivener, and we shall send a copy to Earl Carnarvon to-night. We were in hopes to have been able to send you a Copy by this Mail, but are reluctantly compelled to deny ourselves that pleasure.

On returning to town I found that the Canadian News had announced that the assent of Her Majesty's Government to the Plans of the Delegates had been "informally" communicated to them, yet in the same article it was stated that *at the next meeting of the "Privy Council,"* not the Cabinet, the Resolutions would be confirmed, &c. As I had promised our paper early in the week, I wrote to Lord Carnarvon to say it should be sent in this evening, or, if a day's further delay would make no difference, I should prefer to keep it till Monday. In his Note, last night received, he says "I can only say that the subject of Confederation *is now being considered by me,* and that the sooner that all objections and counter proposals are before me the better." Of course we consider this as rather more authentic than the announcement of the Canadian News. We shall do our own duty and leave the issue to Providence.

As a mere literary performance I am hardly satisfied with our paper, and yet I trust that our friends will not consider it unworthy of their cause. As so much had been written upon the subject of Confederation the great difficulty was to write at all without repeating what had been already said, and yet to include all the arguments which it was important to place before persons who might have to consider the subject for a first time. This has been done with some success I trust, and it will be an awkward document for the Ministry to take down to Parliament should they decide against us. Though of course one hand can only write such a paper as this, it would be doing our friends here great injustice not to acknowledge that it embodies the thoughts of all, and that I am aided and strengthened every day by their friendly co-operation and suggestion.

It is probable that by next Boat we shall be able to advise you as to our Movements. We assume that our House will meet at about the usual time, and that,

by next Boat some of the Delegates will go home. When our papers have gone in our labors will have closed so far as concerns the Cabinets deliberations, and it is not probable that we shall all be required here to watch those of Parliament out of which it is impossible to foresee what may come within the next three months. One thing we know that, while keeping fair with Carnarvon the Delegates are praying for the downfall of the present Government. This leads us to suspect that all has not gone so smoothly as they wished. However, we are prepared for the worst, and if it comes, the consciousness that we have done our best to avoid it will always console us.

You will see that a gentleman named Ludlow¹¹¹ has taken up the "Organization" policy with great spirit, in the London Spectator. That an able writer, in the Imperial Review, endorses the policy in two elaborate articles, while even the Saturday Review has become a Convert, as you will see by its article of today in which will¹¹² professing to explain the proceedings of the Conference it admits that "Organization" must follow Confederation. Having thus roused the shrewd thinkers of England to the consideration of a great National subject of course I am not much disturbed by Archibald's and Tupper's passionate attempts to mystify and mislead the people of Nova Scotia.¹¹³ It will be time enough to answer their letters when we get back before our own countrymen who will, in the meantime, remember that by my plan *no duty would be imposed, and not a shilling would be taken except under laws which had been voluntarily passed by our own Parliaments with the assent of our electors.* I do not propose to tax any body or march any body, by an arbitrary Imperial Statute which Nova Scotians have never¹¹⁴ seen or never approved. As to the Company I keep it is quite as good as that in which Mr. Archibald has been found for some time.¹¹⁵ I shall give him a Bill of particulars some fine day, and, in the meantime am content to leave him in the hands of Judge Marshall¹¹⁶ and my old friend Morrison,¹¹⁷ whose letters I have read with infinite pleasure.

Annand, McDonald, Garvie send kind regards to all hands. As for myself I feel like a soldier singing with natural longings for home, "when will this cruel war be over" and yet not able to leave his post.

God bless you all, and believe me

Sincerely Yours,
JOSEPH HOWE.

Lloyds Weekly, which has an enormous circulation had a Capital Article on our side a fortnight ago. We did not discover it till after the mail had gone. Tupper, like a fool replied to this article under his own signature to which McDonald replied in a long letter under his own name. The Editor using Mac's letter as a base has replied to Tupper in an Editorial a column long in today's paper. Annand will send you the papers with Spectators and Imperial Reviews.

¹¹¹ John Malcolm Forbes Ludlow, born 1821, an English writer of the period on economical and historical questions. Edited *The Reader*, 1863. Contributed to the *Spectator* and other London reviews.

¹¹² Should read "while."

¹¹³ See Bibliography Nos. 64 and 60.

¹¹⁴ This characteristic fling at the forthcoming British North America Act is hardly borne out by the facts. Five eminent Nova Scotians, duly appointed by the Lieutenant Governor of the province, on the formal request of the House of Assembly, took an active part in the preparation of the Bill, and discussed every amendment. A Bill drafted by the delegates of the four provinces, and accepted by the British Parliament to meet the wishes of these representatives of the Colonial Legislatures, can hardly with justice be described as "an arbitrary Imperial statute."

¹¹⁵ Howe was evidently smarting under certain personal comments in Archibald's article.

¹¹⁶ See Bibliography No. 66 also No. 78.

¹¹⁷ See Bibliography No. 77.

London,
25 Saville Row,
Feb. 2, 1867.

Wm. J. Stairs, Esq.
My dear Stairs

On the Saturday night, after the last mail for Halifax left, the case which I informed you we were preparing was sent to Earl Carnarvon. He was ill at the time, and two Cabinet Councils were held during the following week which he did not attend. On the 29th His Lordship sent me a note in which he informed me that "feeling the importance of it, and of the subject to which it referred" he had "given it his careful consideration and brought it under the attention of his Colleagues individually." He thought it "only fair to say, that, after weighing the arguments against the measure, and "especially those in our very able paper" he was "not shaken in his conviction of the advantages to be obtained by a union of the Provinces."

Upon the main point, that the Government have decided to take down the Delegates Bill to Parliament this is decisive.

On the point of reference to the people the note is silent. As I had to send a fair copy of our paper today, I took the opportunity to express a hope that that might be left open. It is now of course the only one we care about. "A touch of nature makes the whole world kin," and a case of injustice or oppression, thrilling through the House of Commons, sometimes upsets all calculations and combinations. This is our only chance. If I could get to the Bar of either House I would be very hopeful. We cannot tell whether or not this can be done, and until the men get together we can as little know what friends we are likely to have. You will perceive that until informed that the measure was to be brought down we could say nothing definite to the Members we talked to, and until the avowal is made that the people are not to be consulted we have no grievance. The debates will soon give us definite information upon all these points. In the meantime our Case is being printed,¹¹⁸ for private circulation among leading Members, which we hope to have done on Monday before the debate on the Address begins.

You will receive with this a copy of our Remonstrance, and we trust the people of Nova Scotia will not disapprove of the earnestness and even boldness with which we have expressed their sentiments and advocated their interests. They must bear in mind that this is no ordinary struggle, but a revolution with which we are threatened. If you think it expedient to do so, you can publish the paper at once, as it can make no difference here as it must go down to Parliament with the other papers soon.

Annand thought of going out by this Boat, but as we learned that the others all intended to remain, we concluded to detain him till the next. He will consult and cooperate with us while he stays, and then will return to aid our friends if any thing is to be done, to share their disappointment if there is not. McDonald and I will watch the proceedings and supply friendly Members with arguments till there is no further hope, and then, conscious that we have all done our best, leave the issues in the hand of Providence.

Mac has been busy during the past fortnight. Lloyds Weekly published a month ago an Article against Confederation. Tupper rushed into print in reply and got served out by the Editor, who availed himself of the information sent him in a letter from Mac (published today) and a private letter from Annand to handle the Dr in good style. Not satisfied the Doctor broke out in the Star, but Mac was down

¹¹⁸ See Bibliography No. 72.

upon him there the next morning. This brought out Henry and Mac knocked him off his pins in a letter which appeared yesterday morning. All the papers with any others which touch our interests, are sent.

You will see the Speeches at the Portsmouth Dinner to Lord Monk in the *Times* an Article, describing the measure itself in the *Pall Mall Gazette*. You will find a Canadian version in an Article from the *Ottawa Times*,¹¹⁹ in *Public Opinion* which will reach you by this mail. From the best information we can gather the *New Nation* has shrunk a good deal. Newfoundland and Prince Edward Islands are not to be coerced and are struck out. British Columbia and the Hudson's Bay territory are struck out, so that the New Nationality has shrunk from 4,000,000 of square miles to 447,000, only 3,553,000 having been knocked out by the opposition.¹²⁰ Another point is settled that it is not treason to oppose this scheme even in sight of the Queen's Palace, and a third, that, as little Prince Edward Islands has not been coerced, and is left out neither would Nova Scotia if a parcel of Sheep had not been terrified out of their wits. Halifax, it is said, is to be relieved of the Railway Debt which it would never have paid, and there may be a few other trifling Concessions, but we believe, as the *Ottawa Times* asserts, the Quebec Scheme has not been changed in any important particular.

Believe me

Yours truly,

JOSEPH HOWE.

25 Saville Row,

Feb. 1867.

Private.

The Right Hon.

Earl Russell.

My Lord

I was sent over to this country in the summer to urge upon Your Lordship's Government the propriety of permitting the people of Nova Scotia to decide their own future at the Polls before any Scheme of Confederation should be sanctioned by Parliament.

¹¹⁹ Established 1844.

¹²⁰ In the Quebec Resolutions provision was made for the union of the Canadas, Nova Scotia, New Brunswick and Prince Edward Island, and for the future admission of Newfoundland, the North West Territory, British Columbia and Vancouver Island. Pope, *Confederation Documents*, 39-40. The Resolutions as adopted by the delegates to the London Conference in Dec. 1866, provided for the union of the Canadas, Nova Scotia and New Brunswick, and the admission of Newfoundland, Prince Edward Island, the North West Territory and British Columbia. *Ibid.* 98. The draft Confederation Bill of Jan 23, 1867, made provision for the union of Canada, Nova Scotia and New Brunswick, and for the admission of Newfoundland and Prince Edward Island. *Ibid.* 142, 156. The draft Bill of Feb. 2, 1867, confined the union to the same three Colonies or Provinces, and provided for the admission of Newfoundland, Prince Edward Island, the North-Western Territory and British Columbia. In this draft the new dominion is named the Kingdom of Canada, and for the first time the two divisions of old Canada are called Ontario and Quebec. *Ibid.* 159, 176. The so-called Fourth Draft makes the same provisions, except that to the colonies whose future admission is provided for is added Rupert's Land. *Ibid.* 177, 210. The Final Draft Bill, of Feb. 9, 1867, agrees with the Fourth Draft. The name of the confederation is changed from Kingdom of Canada to Dominion of Canada. *Ibid.* 212, 246. Howe's statement is therefore incorrect. From the Quebec Resolutions to the British North America Act as finally adopted by the Imperial Parliament, the only real change in the proposed confederation is the dropping of Prince Edward Island. On the interesting points as to who proposed the name "Kingdom of Canada," and who was responsible for its abandonment, see Pope, *Memoirs*, I, 312-13; Bourinot, *Canada under British Rule*, 215.

When I got here the Ministry had changed, and Parliament being, shortly after, prorogued I thought that some good might be done by a public discussion not only of the subject of Confederation but of our general Colonial policy. With this object in view I published the two Pamphlets marked 1 and 2 which I have the honor to enclose, and which in substance contain the arguments with which your Lordship is already familiar. The Pamphlet No. 3,¹²¹ was written by a friend in reply to one from the other side. With these and the Remonstrance sent last week, and which has since been laid before Parliament, in your hands Your Lordship will be in possession of all that has been written here on our side of the question.

Having discussed the subject so fully with Your Lordship last year, of course I do not expect to change the opinions deliberately formed but I am not without a hope that Your Lordship will see the justice and propriety of leaving the Bill on the table until after the May Elections in Nova Scotia. If the people then decide in favor of the measure there will still be two months of the Session left in which to pass it, and we will all help to work it successfully. If they decide against then a great error will have been avoided, and it can be put aside. Surely two months are not much for a fine people to ask of Parliament when all that is dear to them trembles in the balance, and I really cannot see how those who so highly prize the franchise and are seeking to extend it, can, after its peaceful and loyal exercise by a kindred people for more than a century, deny it to them, within two months of the period when their suffrages are to be collected by law, the name of their country is to be changed, its revenues are to be swept away and their institutions are to be overthrown.

For many years your Lordship has permitted me to approach you with the free expression of my opinions upon public questions, a privilege I have highly prized. Perhaps you will not take offense, if pleading for my country I ask, that even for your own sake, and that of the great party of which you are the Chief you will pause before committing yourself to an act which with all respect, will appear at variance with the whole current of your thoughts and with triumph of your long and honorable public life.

Believe me My Lord

With the great respect

Very sincerely Yours

JOSEPH HOWE.

London

25 Saville Row

Feb. 15, 1867.

Wm. J. Stairs, Esq.

My dear Stairs

Annad goes by this Boat and will give our friends all the news. I cannot spare McDonald just yet but hope he may be able to get away by the next.

The Bill, which we were told by the Private Secretary only reached Carnarvon and was sent to the Queen on Monday was brought in to the Lords on Tuesday the Colonial Secretary giving notice that he would explain his views on moving the second reading next Tuesday.

We were not prepared for the opening of the campaign in the Upper House, as it had been announced that the Bill, being a money Bill, would be introduced into the Commons by Adderley. We have no petitions to the Lords, except one from

¹²¹ See note 49.

Newfoundland which as the Island is not included would be useless. There are obvious reasons of convenience why Carnarvon should take this course. It saves time and gives the Upper House something to do, and it enables him to state his own views, which might not be so accurately given by the Under Secretary.

It is not etiquette to furnish any body with a Bill to be brought down by the Government till it has been laid before the Queen and presented to Parliament. We applied for copies as soon as we could and Annand takes out the Bill and the first part of the printed Correspondence. The other has been promised and if it can be got from the Printer in time will also go out.

We have held many anxious consultations upon the present aspect of affairs. The outlook at the Peers is discouraging. Carnarvon will of course be supported by Derby, and Russell can do no less. Then Monk¹²² will be there, and as the attendance will probably be thin two or three speeches from the leaders may be decisive. Annand will explain to you how we proposed to meet this state of things, and the reasons which rather incline us to depend more on our chances to obstruct the Bill in the Commons. We will decide on nothing till after Tuesday, and then act promptly if any good can be done in the Upper House. If not we shall prepare for the final fight below where we have been promised some powerful aid.

We shall confine ourselves now to this single point—*"let the Bill lie on the table till after the May elections in Nova Scotia. There will then be two months to pass it if they are favorable, and it ought not to pass if they are not."*

I fear the copy of our case sent out by last mail contained some small errors. Annand takes Copies that are correct.

Believe me

Truly Yours,

JOSEPH HOWE.

London

25 Saville Row

March 15, 1867.

Wm. J. Stairs, Esq.

My dear Stairs

The prevalence of strong easterly winds delayed the China so that letters from home only reached me yesterday morning. I have yours of the 28th Feb. with letters from Boak and Northup.¹²³

The reports of Annand and McDonald will have prepared our friends for what has occurred here and be assured that I sympathize with you all in what I know will be a general and deep disappointment.

Until the determination of the Cabinet was declared we had well grounded hopes of defeating the enemy. You can hardly understand what these were till you have an opportunity to inspect the whole correspondence. From the time when Carnarvon communicated the decision of the Cabinet I saw that the difficulties would be greatly increased, as a measure supported by all the leading men on both sides, and actively promoted by the Grand Trunk people was almost sure to carry. I still hoped however for something like a fair examination of the question in one House

¹²² See note 53.

¹²³ Robert Boak and Jeremiah Northup. Boak was born 1822. He was a member of the Board of Review of Nova Scotia in 1866. Became member of N. S. Legislative Council 1872, president of that body 1878-1901, Treasurer of the province 1877-78. Knighted. Died 1904. For Northup see Note No. 29.

or the other with a chance that the plan of delay might be entertained, or that the peculiar state of parties might postpone the measure till after a dissolution. On all points circumstances which seemed favorable turned out otherwise. The question of the franchise, by repeated postponements, was got out of the way, and the Cabinet, having nothing else ready, were glad to make a show of doing something, by taking down the Confederation Bill and rushing it through both Houses. By taking the ground that it was a treaty and not to be amended or disturbed, all discussion of the thing as a Scheme of government was discountenanced, and being forced on almost before Members had had time to examine the papers, but few except those who were interested in its passage understood the question. The general, indeed the almost universal feeling appeared to be that *uniting the Provinces was an easy mode of getting rid of them*, and the wish, expressed by the Times, "that independence would speedily follow Confederation," was scarcely disguised by any body. All this is very sad, and will occasion a disruption of old ties and a revulsion of old feelings painful to contemplate.

The high duties of Canada and the failure of the Militia Bill¹²⁴ a few years ago created in this country distrust and dislike, pretty general in the Manufacturing towns, and with a portion of the Press, but this had scarcely reached the governing classes to the extent that a separation from North America was desired. On the return of the Guards from Canada the higher classes appear to have been convinced that the Canadian frontier was indefensible¹²⁵—that service there would be perilous ending in discomfiture and disgrace, and that this country, which can hardly raise troops enough to defend these Islands could never spare soldiers enough to keep in check the enormous armies that the United States could throw across the border if so inclined. This conviction, not openly avowed in all cases, underlay the action of all parties in both Houses on this Bill.

Lord Normanby told us to our faces that we might declare our independence or join the United States whenever we chose, and not a Peer contradicted him. In the Lower House Mr. Watkin was the only member who spoke with any warmth of a continuance of the connection and he was heard with chilling indifference. Indeed the impression left on my mind by all that took place in both Houses, is that the Provinces are a source of peril and expense, and that the sooner the responsibility of their relations with the Republic is shifted off the shoulders of John Bull the better.¹²⁶

¹²⁴ The Militia Bill of 1862, introduced by John A. Macdonald. It embodied the recommendations of a special commission appointed to report on the reorganization of the Militia, and provided an active force of 50,000 men and a reserve of the same strength, at an annual cost of something over a million dollars. The Bill was defeated by the defection of a number of the Lower Canadian members, and the government resigned. Pope, *Memoirs*, I, 236-37. This action of the Canadian Legislature was made the subject of severe comment by many of the leading English newspapers, in which it was very frankly stated that Canada should relieve the Mother Country of at least some of the burden of Canadian defence. Lewis, *Brown*, 147.

¹²⁵ There had been long and serious debates in the House of Lords, Feb. 20, 1865, and in the House of Commons, March 13, 1865, on the subject of Canadian defence, based on the report of Colonel Jervois. Lewis, *Brown*, 183-85.

¹²⁶ This was the day of the Little Englanders, and they had the field pretty much to themselves. What Sir Charles Dilke wrote in 1868 was what most Englishmen were thinking at that time. "At bottom," he says, "It would seem as though no-one gained by the retention of our hold on Canada. Were she independent her borders would never again be wasted by Fenian hordes, and she would escape the terrible danger of being the battlefield in which European quarrels are fought out. Canada once republican the Monroe Doctrine would be satisfied and its most violent partisans would cease to advocate the adoption of other than moral means to merge her territories in the Union. An independent Canada would not long delay the railway across the continent to Puget Sound which a British bureau calls impossible. England would be relieved from the fear of a certain defeat by America in the event of war—a fear always harmful even when war seems most unlikely; relief too from the cause of such panics as those of 1861 and 1866." *Greater Britain*, 66-67.

With all this feeling, however, there was no desire to coerce the Provinces into the arrangement. Newfoundland and even Prince Edwards Island were secure as we would have been had not the weak kneed fools and arrant knaves in our Legislature bound Nova Scotia by their resolution.¹²⁷ With that for a cover, and the strong desire to be rid of indefensible and perillous dependencies that yield no revenue and cost a good deal of money our fate was sealed, and we must now commence a new page of history without vain lamentations over the past.

McDonald will have explained how matters stood when he left. We could not present our Petitions to the House of Commons till the Bill was before it. It was brought down one day and the second reading fixed for the next. Acting upon the best advice I could get I applied to Mr. Horsman¹²⁸ to present the Petitions. He took two days to consider and then declined. Admiral Erskine,¹²⁹ an old friend kindly consented, and Mr. Hadfield¹³⁰ who had early protested against undue haste agreed to move the clause¹³¹ which I enclose, which Erskine had promised to second. Other business occupied the House till a late hour, and the next morning Erskine called to say that at the proper moment, overpersuaded by Cardwell¹³² and others Hadfield had funk'd and failed to move the clause. This so disgusted me that I wrote a note to Bright to say that he need take no more trouble about the matter.

I had often thought of asking to be heard at the Bar of one House or the other. There were difficulties in point of form which might have been got over had parties been so balanced as to render success probable, but with the leading men on both sides certain to resist the application, and the settled convictions of the two Houses so apparent, it seemed only courting defeat to make the application, and I gave up the idea, I must confess with some reluctance.

When the clause touching the Intercolonial Railway¹³³ came up several Members rose to oppose it and were only quieted by Adderly and Gladstone's Assurance that it merely expressed the views of the Delegates and bound them to each other, but did not pledge the House of Commons to advance the money. On this assurance opposition was withdrawn, and the clause passed. It is evident that on this point there is great distrust among the Delegates. The Bill, with the Amendments is now before the Lords, where it is to remain till a Resolution has been passed by the Commons giving the guarantee¹³⁴. It seems almost impossible that it should not pass, but it will be stoutly opposed and there is a fair chance of a spirited debate and perhaps a division before all is over. But guarantee or no guarantee the Canadians have now got the Bill complete, where it can be passed in five minutes and then the Proclamation would issue, guarantee or no guarantee.

¹²⁷ See Note 2.

¹²⁸ Rt. Hon. Edward Horsman (1807-1876). Irish Secretary, 1855-57. Represented Liskeard in Parliament. One of the "Adullamites" of 1866.

¹²⁹ John Elphinstone Erskine, born near Edinburgh, Scotland, 1806. Entered the Navy 1819. Rear-Admiral, 1864. Author of a journal of a Cruise among the Islands of the Western Pacific. Elected for Sterlingshire 1865. A Liberal.

¹³⁰ George Hadfield (1787-1879) radical M.P. for Sheffield. One of the founders of the Anti-Cornlaw League.

¹³¹ "That this Act shall be published in all the Provinces it is intended to unite, but the Queen's Proclamation shall not be issued till the existing Legislature of New Brunswick and the Legislature of Nova Scotia convened after the General Elections now impending have expressed their approval of it in Addresses to the Crown."

¹³² Edward (afterward Viscount) Cardwell (1813-1886). Colonial Secretary 1864-66; Secretary for War, 1868-74.

¹³³ The evolution of this clause may be traced in the various documents from the Quebec Conference Resolutions to the final Act. Pope, *Confederation Documents*, 52, 95, 110-11, 176, 211, 246, 282.

¹³⁴ The interest on three million pounds sterling was guaranteed by the Imperial Government. Pope, *Memoirs*, II, 6.

This report will probably close my labors, which for some months have not been light to say nothing of the responsibility. Success would have been a great joy to us all, but we have our consolations in a sense of duty performed—sound principles vindicated, and truthful words fearlessly spoken. We can look in each others faces and lay our bones beside those of our kindred with a consciousness that we have been true to the living and the dead.

With kind regards to all

Believe me

Sincerely Yours

JOSEPH HOWE

To the Hon Joseph Howe
25 Saville Row
London

Halifax, March 28, 1867.

Dearest Sir,

Your letter of the 15th inst. has been received—and read to those friends—who have been with you—so much interested in shewing the People of England, the state of Public feeling in Nova Scotia—I thought it right—to bring it to the notice of the anti Confederate members of the Legislature and it has elicited from them, jointly with your outside friends—a letter of thanks to you for your most devoted services—and shews if words can express it, their feeling of sympathy for you in this heavy disappointment.

Some say they never expected any other result—that they judged the House of Commons to be as it has proved—but I must say—I am disappointed—I never could have believed the House of Commons was so void of earnestness—and so purely selfish as to disregard the rights and wants of a Colonial People—when their case was clearly and distinctly put.

I must say that if to get rid of these Provinces is their idea, and I believe it is, They have shewn a very clear perception of the mode it is to be worked.

But all vain regrets must be buried and we must to repeat your words:

“look to make a new page in the history of our Country.”

But my dear Mr. Howe this is easier for some than for others—

I am commissioned to convey to you the sense of a meeting of Friends held last evening. The names will be seen in another paper—the Sentiments they expressed—in regards yourself—were these—

1stly. That after the devotion and sacrifice you have made of your self on behalf

of Nova Scotia—it is the wish of your friends and the friends of Nova Scotia,

That you now—should cease from any course of Public action in the interests of Nova Scotia, which may be at a Sacrifice of your personal feelings and interests,

2ndly. Your friends—feel, that should you return and wish to join the Parliament at Ottawa—They will hail your aid as of most serious importance to the Party whose duty it will be to mould the Constitution of the new state—with regard to the interests of Nova Scotia.

3rdly. It was expressed by Mr. McHaffey¹³⁵ that the County of Hants would wether you were absent or present—return you—as a Member of the Parliament at Ottawa.¹³⁶

and now dear Sir—I have tried to convey to you the sense of the meeting—but I feel it has been most imperfectly put—the kindly words which expressed these

¹³⁵ R. A. McHaffey, a member of the Legislative Council of Nova Scotia, and of Annand's Anti-Confederate Government, 1867-68.

¹³⁶ The formal resolution is printed in *Speeches*, II, 507

thoughts—I cannot reproduce. But of this be assured your Friends will now hail with pleasure, any words which may reach them of your being happily Employed in England¹³⁷—and should you return to continue your lot among us—you will ever have the first place among your Countrymen.

Our good friend Northup will write you the State of Public affairs here, as shewn by the Government over expenditures without sanction of law, equal a years revenue of ten years ago, is fearfull. Public men and the Party innings have been going it blind, except to any interests of their own—

Yours sincerely
W. J. STAIRS

London
25 Saville Row
March 29, 1867.

Wm. J. Stairs, Esq.

My dear Stairs

Thanks for your letter by the last mail. I am not surprized at the indignation felt by our friends at the utter indifference shown in Parliament to our interests or our remonstrances. The fact is, they think here only of themselves, and having made up their minds that the Provinces are a source of peril and expense to them—the prevailing idea is to set them adrift, to gradually withdraw British troops from them—to have no quarrel with the United States on account of them, and to leave them to defend themselves if they can, or to pass into the Union if they prefer that solution of their difficulties. Of course we are powerless to do any thing but to punish if we can the rascals who have sold the country. If our people can they should clear them out both of the local and general representation—place the Provincial affairs in the hands of honest men and send to Canada a body of men who will command respect and give us some chance of fair play, leaving the future to the action of the general Legislature which, or I am much mistaken will soon be driven on by circumstances that cannot be controlled.

Every nerve will no doubt be strained by the Delegates and their friends to controll the elections and having in their hands ample means of intimidation, influence and corruption they may succeed. If they do not Nova Scotia may yet play an important part in the future. If they do we can only fold our arms and attend to our private affairs.

You will see in the Times of this morning the debate on the guarantee¹³⁸ which was carried by a large majority. I did not go down to the House or take any interest in the question. I would have thrown over the Railroad to defeat Confederation but as the measure had to pass we might as well have the road. The whole debate is interesting and suggestive, and the article in the Times is even more so. They do not disguise that the policy is to organize the Confederation and then withdraw all the garrisons so that instead of our defence depending on our Consent to Confederation, when once united we are to be left naked and without protection. Here they have great difficulty to recruit the Army, and everybody knows that if all the troops in England were sent to the Provinces they could be outnumbered five to one with slight effort by our neighbors. It is vain for us to look to this country for impos-

¹³⁷ Howe had some idea of entering public life in England, or accepting an office from the Crown, but felt that he could not desert his friends at such a critical juncture. See his reply to Stair's letter in the *Speeches*, II, 508.

¹³⁸ Of the Intercolonial loan.

sibilities. We must now look to the American Continent only for our future. If the Americans let us alone we may work on under Confederation for a few years, but will they let us alone. We shall see. I fear that they will use our fisheries which we cannot need long and will not defend, exclude our staples by high duties, harrass our frontiers with Fenian raids and vexed questions, till our resources are exhausted and our trade is cut up, and finally force us to buy peace and free trade by a sacrifice of our premature independence. This it appears to me is the future before us. I hope I may be mistaken, but whatever comes we have done our best to maintain the happy state of things which existed and our consciences are clear, however the changes which are inevitable may affect our feelings or our interests. With kind regards to all friends

Believe me Sincerely Yours

JOSEPH HOWE

London March 15
1867

I deeply regret that my news in respect of Confederation should be of the most unpleasant description.

As king Francis exclaimed after his disastrous defeat at Pavia, "All is lost except our honour."

Everything was done, that was possible to be done, be sure of that, but if one had come from the dead he would not have got the English Parliament even to look at both sides of the question.

The only people who really cared anything about the matter, were precisely the people whose interest it was to put it forward.

The Grand Trunk influence had a powerful effect on the Government, who being weak were glad enough to bargain about votes for a Reform Bill on condition of a Confederation policy.

More than that I find among English Politicians a growing fear of the United States which is really humiliating. English Statesmen have made up their mind not to fight a land battle on this continent for they know just as well as we do that they could never keep the Yankee troops on their own side of the frontier and that it would be one of the costliest campaigns into which Britain could drift.

They are under the impression that if they do not own a foot of soil in America the Yankees cannot come over to attack them without positive peril—and they are therefore willing upon any pretext to turn us adrift. "I would not care" said a member of Parliament to me "if Grant were in Montreal to morrow so long as we were not bound to find soldiers to drive him out. He would not hurt you if you were not joined to us; and he could never hurt us there; while he would ruin himself by coming to us on board ship."

Mr. Oliphant¹³⁹ M.P. for Stirling who was Lord Elgin's secretary in Canada, and who ought to know British America well enough to distinguish the interests of the Maritime Provinces from Canada, in conversation with me declared that Confederation would have his support because it would take these Provinces off England's hands, on which they were a useless and dangerous incumbrance. As to our local losses he was perfectly indifferent. He admitted that our people seemed against the scheme, but he thought that an additional reason why the scheme should go for-

¹³⁹ Laurence Oliphant (1829-1888).

ward now, for it might be defeated and leave England in the awkward position of having to protect colonies she did not want, or make an open confession to the world that she could not protect them. Mr. Lefevre¹⁴⁰ son of Viscount Eversley and who was a Junior Lord of the Admiralty in the last Government, and is M.P. for Reading used similar language to me, and seemed to consider the loyal preference of Nova Scotia for British connection a bother, and that Confederation would be a relief to the Mother Country by forming a convenient excuse for letting us all go; and his language indicated further that Annexation to the United States if we did not get on with Canada would be the best and most natural destiny for us.

Others held the same views so that you see there was a deep undercurrent; which any logic or loyalty we could appeal to could not stem, it was melancholy to discover how utterly ignorant the majority of English Editors and politicians are concerning us, they did not know the first thing about us and they did not care to know.

None of them ventured to deny the Justice of our case, but then nobody could spare a thought from the questions at home to waste time on us. John Stuart Mill who has written such great things about the liberty of the people, and representative government, and who is so anxious to have even women entitled to vote on public affairs, admitted in my presence that he thought Confederation was being pushed through with disgraceful haste and disregard of Nova Scotia wishes, but he added he could not spare a moment to fight our battle. He thinks no doubt Nova Scotian men are of less importance to him as voters, than the Orange women in Westminster, upon whose right to the franchise he insists so strongly. Mr. Lowe¹⁴¹ was also against Confederation on principles of right but then Mr. Lowe had done enough already to destroy his chances with both parties, and I heard him tell Howe that it was of no use to speak at all in a cause which would be lost through both sides following their leaders. Bright thought Confederation would be remedied by Annexation. And so did Mr. Hadfield M.P. for Sheffield whom I interested in our case, so far that he agreed to move an amendment, which Mr. Howe drew up for him, but Cardwell got at him and cajoled him to withdraw it, after he had expressly promised to proceed with it and after I had given him his "brief" of facts and figures on the subject. The great body of the House was utterly indifferent, even the delegates seemed chagrined at the lazy contempt with which a thin House suffered their bill to pass unnoticed through Committee.

A clerk at the table gabbled on *not* the clauses even but the *numbers* of the clauses and as if that were not, a quick enough mode of rushing through a disagreeably dull measure which did not affect anybodys seat, and which therefore could not be listened to, he used to read a whole batch of numbers at once, for example saying "Moved that clauses 73, 74, 75 pass and they passed sure enough, without anybody worrying himself about their contents."¹⁴² One member who had been in Australia and therefore wanted to drag himself into notice as a great Colonial authority asked some solemnly absurd questions about the Governor General's duties and so forth, and got equally solemn and absurd replies, from Adderley, who stood with Cardwell, as if both were wet nurses for a foundling bill.

¹⁴⁰ George John Shaw-Lefevre, afterward Baron Eversley, born 1832. He was a son of Sir George Shaw-Lefevre, not of Viscount Eversley, as Garvie states. Member of Parliament for Reading 1863-85; Civil Lord of Admiralty 1856; Secretary to Admiralty 1871-74; Postmaster-General 1883-84; President Local Government Board 1894-95.

¹⁴¹ Robert Lowe, afterward Viscount Sherbrooke (1811-1892). He was Member of Parliament for Calne in 1867. Chancellor of the Exchequer 1868-73; Home Secretary 1873-74.

¹⁴² A graphic and sufficiently mortifying picture of the birth of the Canadian Constitution.

The House got livelier and better filled when a dog tax bill came up—for you see the country gentlemen who could not maybe point out Nova Scotia on the map keep fox hounds subject to a tax which interests them more keenly than a Canadian tariff.

I confess this utter indifference was more mortifying to me than positive opposition. I could allow for the action of Watkin, Kinnaid,¹⁴³ and other Grand Trunk members but when I saw English gentlemen sitting where Burke once sat framing his indignant sentences against the Government's disregard for the popular wish in the old American colonies I felt that their changed policy, contrasting so remarkably with his was one of the worst signs of the time. It showed that they considered Colonists beings as little related to them as the inhabitants of some nameless Chinese mud village, and it showed that the complaint so general now in England that this Parliament is utterly indifferent to a proper sense or share of responsibility, and utterly devoid of the quick sympathies with popular rights which used to ennoble the name of the House of Commons is correct.

This is a fair statement of the case, and I have been thus particular for I wish you to form as correct a view of the situation as possible. Poor Nova Scotia! her loyalty deserved a better recognition. What will come of it all I would rather try not to conjecture—my only hope is that Providence which has so highly endowed her with natural resources, and has animated her people with a true spirit of freedom will yet deliver Nova Scotia from her present difficulties into a destiny worthy of his gifts to her.

Poor Howe! the disaster tried his spirit very hard—very, very hard. I had to do my best to condole with him, but when ever we thought of the noble hand who had so materially and generously done their best to assist in the defeat of this iniquitous policy, the anticipation of the regret you will all feel deepened ours.

WM. GARVIE.

Halifax, April 11, 1867.

Dear Sir—

Your letter of the 29 March, has been recd the conclusions you have arrived at—That England will leave us to a "North American Fate" is what we have all pretty much realized. The "Dominion Govt" will only be an affair ad interim—You name it as a "premature independence" but I am not sure if we will only first be independent when we become part of the United States—No one would venture to name the State of New York as not independent and yet if we drift into an alliance with that State among others, we will have full share of her independence. It may yet be, that it is best for us that in this case we have not had our own way. But it is very hard while the head may reason, upon political good or national benefit—for the heart to suffer its strong ties Severed, and we who thought we were loyal British Subjects to find, we might have been with as much thanks, preachers of Yankee annexation, or any other doctrine which would have lauded American Progress—against British Power.

How our children will laugh at the idea of independent Nova Scotians having been governed by such men as Earl Carnarvon and other sprigs of English aristocracy when the time comes that Nova Scotia as the Seaboard part of North America shares in the Power which dominates over the North Atlantic.

But dear Sir as regards beating the Delegates and sending men to the Local and General Parliament the troubles we have is not in the will of the People but to find

¹⁴³ Arthur Fitzgerald Kinnaid, afterward tenth Baron Kinnaid (1814–1887). Member of Parliament for Perth 1852–78.

men who can go into the Legislatures. I have to thank our friends for urgent solicitation to accept a nomination to one or other of these places but have declined—the strongest reason is I have not the physical strength to take up the load. Annand and Power should take the county¹⁴⁴ for Ottawa—But Annand refuses and Power is not over willing. Tupper and John Tobin will try for Halifax and with the Archbishop's help hope to be elected. Tupper is such a pertinacious canvasser that large personality is wanted to meet him. We are all anxious to hear if you are coming this May.

But whether you come or do not I will feel you have a perfect right to mark out your own Path. I trust you will not hesitate to let me know if I can serve you.

Mrs. Howe spent yesterday with us. Seems quite recovered of the indisposition she suffered from in Winter.

With best regards

Believe me yours
truly

WM. J. STAIRS.

London

126 Brompton Road

June 20 1868.

My dear Robertson,¹⁴⁵

Our official report to Vail¹⁴⁶ with the London papers and documents sent out by this mail will convey to you the results of our application to Her Majesty's Government and to the House of Commons.¹⁴⁷

The debate in the Lords will not come off till next week but cannot materially vary the position of affairs as most of the leading men in that House may be assumed to be against us, and we cannot count upon any conspicuous person to advocate our cause. Under these circumstances we may consider the labours of the Delegation over. Nothing more can be done in this country till some movement is made on the other side. It will now become a matter of anxious solicitude to us all as to what course is to be taken. The Government here assumes, from Tupper's representations and the correspondence with Lord Monck that the Canadians are willing and able, nay most anxious to allay all discontent and give us entire satisfaction without any interference of theirs. I do not believe in their ability or inclination to do any such thing. No doubt the Duke of Buckingham¹⁴⁸ would be well pleased if they could and would, and if they did the decision of Parliament might turn out to be a wise one.

But, as I have said, I doubt both their ability and inclination and assuming that I am not far wrong the question arises what are we, left to our own resources to do.

¹⁴⁴ Halifax County.

¹⁴⁵ Robert Robertson, Commissioner of Mines in the Nova Scotia Government, 1867-68. This letter is printed in the *Speeches*, II, 534-36, but is included here to complete the story of Howe's connection with the Anti-Confederate Movement.

¹⁴⁶ W. B. Vail, then Provincial Secretary in the Nova Scotia Government. Born 1823. Represented Digby in Dominion Parliament 1874-78, 1882-87. Minister of Militia and Defence 1874-78. Died 1904.

¹⁴⁷ In February, 1868, Howe sailed for England as a delegate on behalf of the Nova Scotia Government to demand repeal of the Union so far as that province was concerned. Associated with him were William Annand, J. C. Troop, and W. H. Smith. The latter, Tupper describes as "the ablest lawyer on the Anti side in the N. S. House." *Recollections*, 85.

¹⁴⁸ The Duke of Buckingham (1823-1889). Colonial Secretary 1867-68. Afterward Governor of Madras.

I at first thought of addressing a public letter to my constituents, in which, after discussing all possible modes of proceeding, I might indicate the best line of action to be taken. If this were done a key note would be struck and our people be set thinking in the right direction before they give way to despair or commit any indiscretion. But on the other hand if it were, the enemy would at once be made as wise as ourselves and we might lose the advantage of a fortnight's quiet consultation and preparation before they know what we are at. There are various modes by which we may confront our difficulties.

1. We may confess to final defeat, lay down our arms, and accept the best terms we can get from the Canadians. If this were done I have no doubt they would make large sacrifices personal and pecuniary, large enough to justify our resistance down to the point of surrender. We may be driven to this capitulation, and if we were I would lay down my arms without mental reservations and give the system a fair trial in good faith. But I have an invincible objection to this capitulation and I assume that all our friends will share the feeling if anything better can be done.

2. The Executive Council might resign, and as the Governor could not, if our friends stuck together, form another, a sensation might be created by the deadlock and confusion. This would be a very hazardous line to take as our own people would suffer from the public business not being done. You could not stop the supplies as you have no revenue laws under your control and you might split the party and play into the hands of your enemies.

3. We may commence a course of passive resistance, refusing to train or pay duties, and to these alternatives we may, ultimately be driven, but they are hazardous, and if they led to collisions before our people were prepared by close organization and other preparations, would easily be put down and make our cause ridiculous.

4. Open insurrection or intrigues with Foreign Countries I put aside. I am not prepared for them nor do I think our own people are. We may be driven out of our accustomed lines of thought and expression by and bye, and despairing of all other redress may be compelled to take up arms, but this should not be done till all lawful modes of procedure are exhausted and until we have laid the grounds of reasonable hopes of success.

5. Now there is another mode of procedure which if our people can keep their ranks unbroken for six months longer appears to me after long and anxious thought to offer the best chance of a solution to our difficulties.

Last year we had no Party in England. Now though beaten two to one in a House of Commons which is about to expire, 87 men have voted that we have a just cause and nearly all the leading Daily Papers and many of the weeklies have espoused it. The minority includes Mill, Hughes, Fawcett, Aytoun,¹⁴⁹ and many of the leading Scotch and Irish members. Lord Amberley,¹⁵⁰ Earl Russell's son voted for us, and Brights name, on both continents is a tower of strength. It is safe to assume that millions of people will hear for the first time of the grievances of Nova Scotia when they read his speech of Monday last.¹⁵¹ If our people can maintain their organization and with their spirit unbroken and with the sympathy and assistance of their neighbours in the other Provinces can come before a reformed Parliament six months hence in which the combination between Cardwell and Adderley is broken up and where Bright if the Liberals win, is sure of a seat in the Cabinet we may yet have a reason-

¹⁴⁹ John Stuart Mill, then Member of Parliament for Westminster; Thomas Hughes, author of *Tom Brown's Schooldays*, then Member of Parliament for Lambeth; Henry Fawcett, Member of Parliament for Brighton, and author of the *Manual of Political Economy*.

¹⁵⁰ John Russell, Viscount Amberley (1842-1876). M.P. for Nottingham 1866-68.

¹⁵¹ Tupper gives the result of the vote on Bright's motion for an inquiry into Nova Scotia's case against Confederation as 183 against to 87 for, a majority of 96 against the inquiry. *Recollections*, 95.

able chance to win the game. The general opinion here is that Bright will take the office of Colonial Minister. If so we are pretty safe to win.

If our friends think this experiment worth trying then I would suggest that the Executive Council hold their places, meet the locals and transact the public business in August under any form of protest they choose to adopt.

They had better be summoned a day or two before the 6th. The Dominion men should be invited to meet them, and if we could get influential Delegations from New Brunswick, Newfoundland, and Prince Edward Island to come over we might not only be able to present a most imposing front to the enemy, but to lay the foundation of a Maritime Union and to open Negotiations in a public and legitimate manner with the Government at Washington for the restoration of our trade.

If we can do all this, and if in the meantime the Colonial Office breaks down (as it is sure to do if we are firm) with its pledges of Canadian Conciliation we may come triumphantly out of the struggle. If all fails there are but six months more of life lost and we can either submit or fight when we are that much older.

This is the best counsel I can give and I do not offer it without many anxious surveys of the field and grave reflection. If it is approved let my boys make copies of this letter to be shown to Stairs, Power, Jones, Gibson, Boak, Northup, McDonald¹⁵² and any other of our friends in town on whose discretion we are accustomed to rely and you might enclose copies to McLelan, Hugh McDonald, Killam¹⁵³ and any other of our friends whom it may be prudent to consult in the country. If it is thought wise to seek the Co-operation of the other Provinces, then special messengers should be sent to explain the policy and report the prospects of aid, that we may be ready to move on the arrival of the next Boat.

I have read this letter to Annand, Troop, & Smith and am happy to report that they all concur in the advice given. Let Sydenham¹⁵⁴ keep a copy of this letter as I have no time to make one before the mail goes.

Yours truly
JOSEPH HOWE

APPENDIX.

THE MARITIME PROVINCES of British America now enjoy all the blessings of self-government, controlling their own revenues, forming, controlling and removing their own Cabinets; appointing their own Judges, Councillors, and Public Officers; regulating her own Trade, training their own Militia, and discharging all the duties of loyal British Subjects in due subordination and steadfast allegiance to the Crown.

The people of these Provinces have lived in harmony with each other—have no disputes with neighboring States—no controversies with the Mother Country, have ever been prone to mutual sympathy and protection, and are ready to uphold the honor of the national flag, and the integrity of the Empire.

They are willing to promote well-considered measures for the joint construction of railways, and the establishment of Inter colonial lines of steamers—for the inter-

¹⁵² W. J. Stairs, Patrick Power, A. G. Jones, John Gibson, Robert Boak, Jeremiah Northup, Edward McDonald.

¹⁵³ A. W. McLelan (1824-1890) Senator 1869-81, M.P. for Colchester County (1881-87) successively President of the Council, Minister of Marine and Fisheries, Minister of Finance, and Postmaster General, in the Dominion Cabinet, 1881-88; Lieutenant-Governor of Nova Scotia 1888-1890. Thomas Killam, member of Legislative Assembly of Nova Scotia; M.P. for Yarmouth 1867-69. Died 1868.

¹⁵⁴ His son, Sydenham Howe.

change of staple and of domestic manufactures; for the adjustment of a uniform currency; the general extension of Free Trade, and for the arrangement of such measures of mutual defence as shall place, in time of war, all the physical force of the Provinces under the control of the Military and Naval Commanders-in-chief appointed by the Queen.

But they are opposed to rash innovation and revolutionary changes. They are specially opposed to the Scheme of Confederation arranged by certain gentlemen at Quebec in 1864, without any authority from the people they profess to represent; and they are equally opposed to the measure now in contemplation, by which it is intended to overthrow the established institutions of these Provinces by an Act of Parliament prepared by a secret committee, without the sanction of the loyal People, whose future it is intended to bind, and whose interests and wishes it is designed, in a most high-handed and unconstitutional manner, to override and disregard.

This LEAGUE is formed to protect the institutions of the Maritime Provinces from such rash innovation—to assert the right of the people to be consulted before their revenues are swept away; and a distant authority, which they can never influence, is invested with powers of dictation and control which the Queen's Government, for a quarter of a century, has not pretended to exercise.

The undersigned pledge themselves, each to the other, to protect the Maritime Provinces from radical changes by all lawful means and agencies, and, with this simple end in view, enroll themselves as members of this LEAGUE.

London Times, 16 Aug. 1866.

It is understood that an arrangement has been come to between the British Government and the Nova Scotia and New Brunswick Commissioners, with the concurrence of the Canadian Government and Legislature, on the details of the Confederation of British North America, and of the Imperial guarantee of the sum required by the Inter-Colonial Railway. This guarantee has been promised successively by Lord Grey in 1851, by the Duke of Newcastle in his despatch of the 12th of April, 1862; and by Mr. Cardwell, in a despatch of the 17th of June, 1865 but it was made dependent on the assent of the provinces to the Confederation, which Nova Scotia and New Brunswick had until now withheld, and also on further evidence that the sum of 3,000,000*l.* originally stipulated for should suffice for the purpose. All the Provinces have now agreed to the Confederation, and it is said to have been conceded that a contingent fourth million shall, if found necessary, be further guaranteed. Canada, however, having already constructed 120 miles of railway, from Quebec to Trois Pistoles, and Nova Scotia 60 miles, from Halifax to Truro, there remain but 360 miles to construct, and, at the official estimate, of 7,000*l.* per mile, probably the 3,000,000*l.* will suffice. The Halifax and Truro line has cost under 500,000*l.*, or about 8,000*l.* per mile. The primary guarantee is to be given by the Provincial Legislatures in the following proportions:—five-twelfths by Canada, three and a half twelfths by New Brunswick, and the same proportion by Nova Scotia. Certain securities are to be hypothecated in return for the supplementary Imperial guarantee, which is calculated to enable the colonies to borrow at about 4 per cent. The Canadian Commissioners have just arrived; but their business is now reduced to little more than the form of signing the convention for the Confederation and the railway guarantee, which Lord Carnarvon, it is understood, is remaining in town to complete. The nature of the country to be traversed is not such as to render the Intercolonial Railway, which will not be commenced immediately, a very tedious affair. It is

calculated to bring Quebec within 18 hours of Halifax. Meanwhile, it appears that Mr. Brydges, the managing director of the Grand Trunk Railway, with the view of doing as much as possible during the interval, has given an immediate impetus to the intercolonial traffic of the Grand Trunk by placing two lines of steamers from its terminus at Portland, the one to St. John's, New Brunswick, and the other to Halifax. In a pamphlet lately published at Montreal, Mr. Brydges asserts that a large trade is likely to be carried on from Canada, and from Maine, Vermont, and New Hampshire with Nova Scotia and New Brunswick, through the Grand Trunk line to Portland, with the aid of these steamers, pending the construction of the Inter-colonial Railway.

London Times, 17 Aug. 1866.

The following relates to the question of the Inter-colonial Railway through the British American provinces and the contemplated Imperial guarantee:—

"Sir,—In your Money Article of this morning reference is made to the subject of the Confederation of the British North American Provinces, and a guarantee on the part of the Imperial Government of the required funds for constructing the proposed intercolonial railway. Several errors have unintentionally crept into this statement.

"In the first place, although the Nova Scotia and New Brunswick Commissioners or delegates have arrived in London with plenipotentiary power to arrange with the British Government the draught of an Act of Parliament to confederate the provinces they represent, the Canadian Commissioners have not arrived. It is expected, however, that they will arrive early in September, and it is understood that the Earl of Carnarvon will meet with the delegates from the provinces represented as soon as they have settled among themselves the basis of arrangements more immediately affecting their respective positions and interests.

"By the terms of what is known as the Quebec scheme, and which it is expected will still constitute the basis of Confederation, the loan to be guaranteed by the Imperial Parliament is not to be upon a 'primary guarantee to be given by the Provincial Legislature, five-fifths by Canada, and three-and-a-half-twelfths by New Brunswick, and the same proportion by Nova Scotia;' that was the arrangement of 1862, which has been abandoned. The amount, say 4,000,000*l.* which it is proposed to raise by means of an Imperial guarantee to construct the Intercolonial Railway, is to have for its basis an Act of the Confederated Provinces pledging their entire revenues for payment of this loan.

"ONE OF THE DELEGATES."

INDEX.

- Adderley, Sir Charles B., 426, 455; and Intercolonial Railway, 458; supports Confederation, 462; political combination, 465
- Albion*, New York, 432
- Almon, Mather Byles, opposes Confederation, 438; biography, 438
- Amberley, Viscount, 465
- Annand, William, 410; delegate of League, 411; sent to England to oppose Confederation, 411; his pamphlet, 411; goes to England on repeal mission, 413; on Intercolonial, 430; biography, 431; replies to Tupper, 435; prepares case, 451; returns home, 455; suggested for Dominion Parliament, 464; repeal delegate, 464
- Annexation of Canada, 424; advocated by Bright, 462; and Hadfield, 462
- Appendix, 466-68
- Archibald, Sir Adams G., delegate to London conference, 423; biography, 423; on finance committee, 446; pamphlet, 452
- Athenaeum*, London, 434, 448
- Aytoun, Scotch member, 465
- Banner*, Toronto, 432
- Better Terms Arrangement, 416
- Bibliography, 416-422
- Blatchford, Baron, 437, 447
- Boak, Robert, 466; treasurer of League, 430; biography, 456
- Bright, John, moves for Commission of Inquiry, 416, 465; the *Star* his organ, 437; and the Irish Estates, 440; annexation of Canada, 462
- British Columbia, and the British North America Act, 454
- British North America Act, passed, 411; provisions as to Provinces entering union, 454; in Parliament, 455-59, 460, 461-63, 464-66
- Brown, George, 432
- Brown, Peter, 432
- Buckingham, Duke of, despatch to Lord Monck, 413, 415; biography, 464
- Byron, Lord, his house, 432
- Canadian defence, 457
- Canadian News*, 435, 446, 450, 451
- Cardwell, Edward, 458; supports Confederation, 462; political combination, 465
- Carnarvon, 4th Earl of, 425, 426; relations with Howe, 427, 428, 429, 435, 439, 447, 448, 449, 451, 453; supports Confederation, 453
- Cartier, Sir George E. delegate to London conference, 423; and Lamorand case, 447; and the Grand Trunk, 447
- Chambers, F. H., 442
- Charlottetown conference, 410
- Chisholm, J. A., 410
- Cogswell, opposes Confederation, 438
- Collins, Enos, opposes Confederation, 438
- Confederation pamphlets, 417-22
- Connolly, Thomas, Archbishop of Halifax, 430; supports Confederation, 431; friend of D'Arcy McGee, 445; and Nova Scotia politics, 464
- Crane, William, 441
- Daily News*, London, 433, 434, 435, 436, 444, 448

- Derby, 14th Earl of, 425, 431; supports Confederation, 456
 Derby, 15th Earl of, 428, 431; relations with Howe, 431, 432
 Dilke, Sir Charles, on independence of Canada, 457
Diplomatic Review, London, 436
 Dorion, Sir A. A., opposes Confederation, 444
 Duffus, James, 430
 Durham, Lord, 438
 Elcho, Lord, 445
 Elliott, P. F., 427, 429
 Erskine, John E., 458
 Eversley, Baron, 462
Examiner, London, 436, 444
Express, London, 434
 Fawcett, Henry, 465
 Fenian raids, 424, 440
 Fenian rebellion in Ireland, 445
 Fisher, Charles, delegate to London conference, 423, 445
 Fleming, Sir Sandford, 430
 Galt, A. T., on finance committee, 446
 Garvie, William, 443, 444, 447; secretary of League, 430; biography, 436; prepares case, 451
 Gibson, John, 466
 Gladstone, W. E., 458
Globe, London, 446
 Gordon, Arthur Hamilton, supports Confederation, 438; charged with partizanship, 440
 Graham, Cyril C., 448
 Grand Trunk and Cartier, 447, influence with British Government, 461, 463
 Grant, George M., 410
 Grant, W. L., 410
 Grey, Earl, 430
 Hadfield, George, 458; advocates annexation, 462
 Haliburton, T. C., on federal union, 442
Hampshire Independent, 444, 446, 450
 Hampton, Baron, 425
 Hay, Sir J. C. Dalrymple, 437
 Henry, W. A., delegate to London conference, 423; biography, 423; in London, 445; speech at Scottish dinner, 445; letter on Confederation, 454
Herald, Montreal, 444
 Horsman, Edward, 458
 Howe, Joseph, character, 410; relations with Tupper, 410; views on Confederation, 410; delegate of League, 411; sent to England to oppose Confederation, 411; his pamphlet, 411; anti-confederate campaign in Nova Scotia, 412; sweeps the Province, 412; elected for Hants, 412; goes to England on repeal mission, 413; conversations with Tupper, 413-15; returns to Nova Scotia, 416; joins Dominion Government, 416; bibliography, 416; suggests Commission to report on Confederation, 414, 443, 444; offered seat in cabinet, 415; his instructions from League, 423-5; on Intercolonial, 430; president of League, 430; prepares pamphlet, 431; prepares second pamphlet, 434-35; Campbell on, 435; attitude towards Confederation, 437-8; letters on the "Botheration Scheme," 438; Fishery Commissioner, 438; organization of the Empire, 441; advocates lines

- of ocean steamers, 441; immigration policy, 441; breach-loading rifle, 441; on colonial system, 442; speech on Scottish literature, 445; speech on press, 448; prepares case, 451; the Remonstrance, 453, 455; thanks of associates in League, 459; offered Hants county, 459; future course of Nova Scotia, 460-61; repeal delegation, 464; movement for repeal, 464-66; suggests Maritime union, 466
- Howe, Sydenham, 466
- Howland, Sir W. P., delegate to London conference, 423
- Hughes, Thomas, 465
- Imperial Review*, 450, 452
- Imperial union, 410
- Independence of Canada, 457, 461
- Intercolonial Railway, 413, 415, 428, 430, 467-68; guarantee, 460
- Jervois, Col., report on Canadian defence, 457
- Johnson, Andrew, President of United States, 424
- Johnson, John, delegate to London conference, 423
- Johnston, James W., 438
- Jones, Alfred Gilpin, 466; opposes Confederation, 438; biography, 438
- Kerry, Bishop of, 426
- Killan, Thomas, 466
- Kingdom of Canada, 454
- Kinnaird, A. F., 463
- Kinnear, T. C., opposes Confederation, 438
- Königgratz, Battle of, 425
- Lamorand case, 447
- Langevin, Sir H. L., delegate to London conference, 423
- League of the Maritime Provinces, 409; organized, 411; constitution, 411, 428, 466-7
- Le Marchant, Sir J. G., 441
- Lindsay, Charles H., 445
- Lloyd's Weekly*, 434, 446, 452
- London conference, 448
- London Review*, 434
- Longley, J. W., 410
- Lowe, Robert, 462
- Lower Canada, memorial against Confederation, 444
- Ludlow, J. M. F., 452
- McCully, Jonathan, Confederation delegate from Nova Scotia, 411; delegate to London conference, 423; biography, 423; writes on Confederation, 432; pamphlet, 448
- McDonald, Edward, 466
- McDonald, Hugh, 444, 466; delegate of League, 411; sent to England to oppose Confederation, 411; his pamphlet, 411; biography, 436, 447; arrives, 448; prepares case, 451; replies to Tupper, 453; replies to Henry, 454
- Macdonald, Sir John A., negotiations with Howe, 416; delegate to London conference, 423; and Confederation, 432; attacked by *Telegraph*, 433
- McDougall, William, delegate to London conference, 423
- McGee, Thomas D'Arcy, 440, 445
- McHaffey, R. A., 459
- McKay, Dr., 446
- McLelan, A. W., biography, 466

- Maritime Union, 410; suggested by Howe, 466
- Marshall, Judge, pamphlet, 452
- Militia Bill of 1862, 457
- Mill, John Stuart, 462, 465
- Milner, Viscount, on Confederation, 442
- Mitchell, Peter, delegate to London conference, 423, 445 carries New Brunswick on Confederation, 423; speech at Scottish dinner, 445
- Monck, Viscount, Buckingham's despatch to, 413, 415; accused of treason, 436; speech in Canadian parliament, 436; deep interest in Confederation, 436; and Cartier, 447; Portsmouth dinner, 454; supports Confederation, 456
- Moren, James, opposes Confederation, 438
- Morning Post*, London, 446
- Morrison, pamphlet, 452
- New Brunswick, carries Confederation, 423; elections, 440
- Newcastle, Duke of, 430
- Newfoundland, opposes Confederation, 423, 440; petitions against Confederation, 427, 455-6; admission of, 454; and Confederation, 458
- New Monthly Magazine*, 450
- Normanby, 2nd Marquis of, 427, 439, 457
- Northup, Jeremiah, 466; biography, 432; letter from, 456
- Nova Scotia, Assembly adopts address for repeal, 412; Assembly adopts Confederation, 423; petitions against Confederation, 425, 427, 436, 451; opposition to Confederation, 437, 438; supports Confederation, 437; revenue, 441
- O'Brien, Mr. 426,
- Oliphant, Laurence, 461
- Overstone, Baron, 445
- Pakington, Sir John, 425
- Pall Mall Gazette*, 444
- Palmerston, Viscount, 426
- Power, Patrick, 430, 466 biography, 432; suggested for Dominion parliament, 464
- Prince Edward Island, opposes Confederation, 423, 440; extinguishing proprietary rights, 440; and Confederation, 458
- Prior, William, opposes Confederation, 438
- Public Opinion*, 444, 454
- Quebec Conference, 410, 423, 439, 443
- Reform Bill, defeat of, 425, 426; introduction, 445
- Repeal, Assembly adopts address, 412; Halifax resolution, 412
- Ritchie, J. W., delegate to London conference, 423, 445
- Robertson, Robert, 464
- Rogers, Sir Frederick, 447, 449
- Russell, Earl, 425, 454; supports Confederation, 456
- Sampson, financial editor of *Times*, 427
- Saturday Review*, 446, 452
- Separate school question, 436-7
- Shaw-Lefevre, G. J., 462
- Sherbrooke, Viscount, 462
- Smith, Sir Albert, succeeds Tilley, 423
- Smith, W. H., goes to England on repeal mission, 413, 464
- Spectator*, 434, 446, 450, 452
- Stairs, John F., 425
- Stairs, William, 425

- Stairs, William J., 466; biography, 425; vice-president of League, 430
Standard, London, 436
Star, London, 433, 434, 437, 453
Sun, London, 448
Telegraph, London, 433, 435, 444, 446
Tilley, Sir S. L., delegate to London conference, 423; defeated on Confederation issue, 423; relations to Confederation, 439; on provincial subsidies, 446
Times, London, articles on Intercolonial, 428, 467-8; predicts independence of Canada, 457
Times, Ottawa, 454
Tobin, John, 430; candidate for Halifax, 464
Troop, Jared C., goes to England on repeal mission, 413, 464
Tupper, Sir Charles, Confederation's debt to, 410; relations with Howe, 410; pamphlet in reply to Howe, 411, 435; elected for Cumberland, 412; opposes repeal movement, 413; conversations with Howe, 413-15; delegate to London conference, 423; carries Confederation in legislature, 423; drafts despatch for Buckingham, 415; Campbell on, 435; on provincial subsidies, 446; pamphlet, 452; letter in *Star*, 453
Uniacke, Andrew M., biography, 438
Uniacke, James B., 438
Vail, W. B., biography, 464
Vancouver Island, proposed union with Canada, 454
Verdon, Receiver-General of Victoria, 436, 444
Watkin, Sir Edwin W., 450, 457, 463
Weatherbe, Sir Robert, 409; secretary of League, 430
Weekly Despatch, London, 446
Wemyss, Earl of, 445
Williams, Sir William Fenwick, 426; supports Confederation, 438
Wilnot, R. D., delegate to London conference, 423
Young, William, 438

Signposts of Prehistoric Time.

By W. D. LIGHTHALL, F.R.S.C., F.R.S.L.

(Read May Meeting, 1916).

How old are the mask-customs of American Indians? How old are their sweat-baths? How old their totemism, their scalping, their drumming, their canoe "eyes," their offerings to root-spirits, the scalp-lock, the warpaint, the costume, the forms of armor, of weaving, of basketry? How far is it possible to estimate the age, or at least the relative ages, of some of the successive waves of their tribal advents in America, by way of the Japan Current, the Aleutians, and possibly other directions? I have not the temerity to attempt answers to such questions as these, which crowd in from that fascinating past—but only to briefly note a few suggestive points, because I know enough of the profound and painstaking work of the students of primitive man to shun the worst form of impertinence. Has not the age of Man upon the earth, from his first prehistoric representative been variously estimated at from a quarter of a million to a million years, and the process of his development been sketched for us in the masterly review of Professor Hill-Tout in 1914 here? From another end it is possible to roughly estimate the age of Egyptian, Akkadian, Cretan, Hittite, and early Aryan, and some other forms of early civilization, in the combined light of history and excavations.

But another form of calculation on the subject, though much less clear and exact, is yet very valuable if it could be carefully studied. This is the estimation of the time taken by the spread of various types or strata of culture throughout the world, especially those which overflowed into America. For example, it is one thing to attempt to estimate the age of man in general calculated by the earliest and crudest forms of stone implements. It is obvious and trite that such an advance as the polished and well-shaped neolithic kfts of tools, represent an immense period of time to develop and spread. Again the presence of forms of large and well-shaped barbarian pottery bowls would indicate another immense advance in point of time—and even the appearance of any pottery at all would mark the lapse of vast ages since the first development of neolithic tools. And when we come to the sacrificial pyramids and handsome rock carvings of Chichen-Itza and compare their resemblance with early Japanese building we can note a wave of culture preceding the six thousand

years or so B.C., of the first civilizations of Mesopotamia, and concerning which the mere spread of such a civilization to the American continent and its development here indicates another interesting hurdle in the race course of time. I think we can lay down these principles in the matter:— (1) That the forms of culture in the American continent constitute various waves of advent from the Old World¹ and perhaps Polynesia; (2) that they had not greatly changed in the New World, up to the arrival of Europeans; (3) that each pictures for us a whole separate age of culture derived from some once dominant Old World race, whose original habitat, diffusion and relative age might be sought by piecing the American and Asiatic portions of the facts together. It is obvious that the Iroquois peoples, with their palisaded villages, and crops of maize, beans and tobacco, possessed a culture of the “higher barbarian” type which was much in advance of that of the wandering Algonquins and similar tribes, and yet that even the latter possessed institutions (such as the sweat-bath and fine basketry) which indicated a wave of culture that, although simple was still considerably beyond those of for example, the Bushmen and Tasmanians, and at any rate was distinctive and later. I have estimated that the Mohawk tribe, who were pure Hurons, and had come from the Island of Montreal and surrounding country, arrived there from the Huron country between Lakes Huron and Simcoe somewhere about the year fourteen hundred. If conjecturally it might be said that the Hurons of that region and their relatives, the Tobacco Nation, the Senecas, and the Nation-of-a-Speech-a-little-Different, had taken, say, three or four hundred years more to develop their dialectic and other differences out of a common local tribe, this would bring us to say one thousand A.D. And if they and their more distant relatives the Cherokees, whose language was very much further removed, might be conjectured to have met in a common origin, let us say 500 years before—that is to say bringing us back to about 500 A.D.—we would have some dim notion of a relative chronology, admittedly incorrect, but yet illustrating the course of my meaning. Indian scholars differ as to the origin of the Iroquois, who were certainly an intrusive element from the south—probably by way of the west—into the great Algonquin territory, just as the Algonquin peoples were at a very early day intruders into the territory of the Eskimo, the Athabaskans, and possibly other primitive races.

The late Cyrus Thomas held that the Iroquoian stock was merely a continuation of that of the Mound Builders. But wherever they came from in later times, they certainly came and brought their

¹ Sir E. B. Tylor seems to still doubt this, from his article *Anthropology*, in the *Encyclopedia Britannica*.

peculiar agriculture and all their special forms of culture *from the south*, and perhaps another thousand years preceding 500 A.D. would have found them in the present territory of Mexico or proceeding in general from that direction. Even then we would not have touched the question of where their special forms of culture originally came to them, and they were certainly derived from the Old World and formed there, apparently partly in Africa and partly in western Asia. Some indication of the immense period of time, taken in the process will appear from the following slight examples:.

The Caughnawagas are the descendants of Iroquois converts established in the latter half of the seventeenth century at the Jesuit Mission of Sault St. Louis or Caughnawaga, about ten miles from Montreal. Although Roman Catholics for so long and far advanced in the ordinary ways of civilization they still retain a number of their original ideas, somewhat as a rural community in the Highlands of Scotland retains the superstition of the second sight and the clan and chief ideas. They have only recently given up the system of a council of chiefs and of community of lands, and have a secret society of medicine-men who cure by the ancient methods. In the spring some of the women go into the woods to seek well-known medicinal roots. When they take up a root, they follow an ancient custom of dropping in the hole in the earth *some small metal button or other bright object* as a propitiation to the spirit of the plant. This of course is part of the beautiful Indian idea (and why is it not true?) that every plant and tree is a living being and has a soul. Originally an invocation was uttered to the spirit of the root, when it was extracted from the soil. Let us compare this system with one in western Asia. In the Syriac Book of Medicine, translated by the Orientalist, Dr. E. A. Wallace Budge, is a statement regarding the wonderful virtues of "the great Kahina root" "the King of all roots." The "Book of Medicine" is the encyclopædia of materia medica and medical practice which has been handed down in Syria from the most ancient times, probably starting with Egyptian science, adding Chaldean magic and astrology, and incorporating root lore, observations of disease, forms of incantation, zodiacal lore, omens, Greek ideas and other additions from age to age.

The passage on the Kahina (or sacred) root is one of these added passages, but evidently derived from very ancient origin. "Know thou that this root was the first born of all the roots which came up from the earth, and King Solomon was wont to use it. . . . When thou wishest to pull up this root cleanse thyself from impurity and eat not bread which hath been made by women. And wash thy head and array thyself in white apparel and keep fasting until thou seest the stars. And come thou to this root on the sixth day of the month Iyyar and

say thou to it 'Peace be to thee, O Kahina Root.'" Then follow prayers to be said and after three days it is to be pulled in a certain manner. "And when thou hast pulled it up bring a *thin plate of gold or silver and bury it in the place where the root was and cover it over.*"

Through what vast ages of time has this custom travelled,—connecting in one origin the culture of the Iroquois and some allied culture which had a branch in early Syria. Some of the questions arising are: How wide is the entire spread of the custom? What space of time is involved in that general spread? And if the Iroquois stock were somewhere in northern Mexico about say 500 B.C., how long before did their ancestors (or those from whom they derived their custom) cross the Pacific Ocean and arrive from Eastern Asia? Did they come by the Black Current past Hawaii or—much more probably—by the Aleutians from Japan or Siberia? In either case how old was then that form of culture in Asia from which their ancestors derived this custom? Certainly it was there long before Chinese history began or the rudiments of Chinese civilization drifted over the mountains from Mesopotamia. The antiquity of the Iroquoian deposit of culture leads us back through immense vistas. Patient endeavor and speculation on facts like these might build up one phase of "prehistoric history" having considerable value and analogous to "geological history" from comparisons and stratifications.

A second illustration likewise is so striking that it can be easily followed in its spread. In Sir George Grey's "Polynesian Mythology" he relates a traditional story carefully handed down by the Maoris from the days—perhaps a thousand years ago—when their ancestors lived in that unknown island home "Hawaiki" (thought to be Savaii of the Samoan group two thousand miles distant), before the migration in the "six war canoes" to New Zealand—that the hero Whakaturia, being captured, was hung up in the roof of Uenuku's great house so that he might die by being stifled with the smoke; and they sang and danced beneath him, "but their dancing and singing were shockingly bad." Then his brother Tama climbed up to him in the night and said "Would it not be a good thing for you to say to them: I never knew anything so bad as the dancing and singing of those people." He did so, and Uenuku's people, curious to see better dancing, took him down, and he prepared himself for the dance with great ceremony, demanding a bright fire and flourishing his sword, and dancing down one side of the house and up the other. "Then Whakaturia *as is the custom in the dance, turned round on his right hand, stuck out his tongue, and made hideous faces on that side; again, he turned round on the left hand and made hideous faces on that side; his eyes glared and his sword and his red apron looked splendid.*"

This curious ceremonial *usage of making a wry face and sticking out the tongue on one side*, is of similar great antiquity to that of dropping the bright offering into the root-hole. It is frequent on Iroquoian masks. It appears on a British Columbian West Coast mask in my possession. And I have observed it even in a Swiss mask in the National Museum at Zurich, apparently derived from some remnant of the Lake Dwellers remaining in the hills. Europe, a few thousand years ago, was racially merely an extension of Asia. The nomadic Mongoloid tribes found no difficulty in passing the low Ural hills, and ranging far into the West, as we know from the incursions of the Huns, the Golden Horde, the Bulgars and other movements, and the customs of the Lapps and Finns, Ugriic peoples, with their wigwams and sweat-baths, and other signs of far cousinship with the Kamtschatkan Tchuktchis or "Indians of Siberia" and the American Indians. Masks were used very widely in sacred dances, and were in fact regarded as endowed with mystic life, on the same principle as idols. That principle was that *if you made a shape, a corresponding spirit enters it*. But if the general connection of Iroquoian masks with Asiatic mask usages be obviously of vast antiquity, are we not ready to find a relatively long and more specialized and traceable age, in this distinctive wry-face-and-tongue form of them which unites in one history the Iroquois, the Maori, and that early Swiss folk? If the Maori having it had still scarcely moved five hundred years ago, and had been in Samoa say a thousand years previously, and the Iroquois had moved but little two thousand years ago, and that Swiss element had probably not migrated at all within say five thousand years, (I am merely using rough illustrative periods) how many thousand years beyond that again must we go back to find the common sacred dance at which their common forefathers were present and saw this rite for the first time? Will less than twenty thousand years compass this little link in anthropologic time?

Again, some light on those great datemarks, the migrations to America, ought to be derivable from studies of the indispensable conditions for crossing the Pacific, and particularly the stages of development of navigation. Savages in canoes came first the easiest way—by the Aleutians or Behring Straits. The first of them were the northernmost canoemen, the Eskimo, or some pre-Eskimo Neolithics. On the other hand, advents by the Japan current presuppose large vessels, of sufficient size to survive a long voyage. The study of shipbuilding in Egypt and along the coasts of Southern Asia, with the connected civilizations, apparently contain the clues to the Central American civilizations.

By putting together some such characteristic and persistent elements, perhaps some well-defined minor waves of widespread culture may be made out by which—comparing especially their Old World “stratification” with their New World “stratification,”—early human chronology might be considerably advanced. Geology began with just such crude hypotheses from estimates of stratification. History, archaeology, philology and geology all put together, need still whatever helps sociology can bring them in their gropings into the prehistoric developments of our race; but there and here it is possible to raise a few signposts even if the miles cannot be given.

The Romance of a Manuscript.

By SIR WILLIAM PETERSON, K.C.M.G., F.R. Sc.

(Read May Meeting 1916).

I am not sure that I may not perhaps be seeking to lead The Royal Society into a somewhat unfamiliar region when I undertake to tell the story of a remarkable find made some years ago now, in connection with a study of the manuscripts of Cicero. But when pressed to read a paper in this section, I felt that it might not be inappropriate if I were to base my contribution on one of the most interesting episodes in my own work. The burdens of University administration demand, as you will readily understand, some form of recreation; and mine has been taken in the study of Latin Palæography. This may help to account for my frequent visits to the other side of the Atlantic, as the material for such study is found only in European libraries. My most familiar haunts have been London, Oxford and Paris. The fact that it is my own research work may also be an apology for a somewhat excessive use of the first personal pronoun in the introduction to what I have to say. This I trust my audience will attribute to the necessity of the situation.

The motive for a review of results at this time may be found in the fact that I am just bringing out a second edition of the Oxford text of Cicero's famous Speeches against Verres. It was in 1901 that I announced through the medium of a pamphlet published in the Oxford Anecdota Series¹ the discovery and identification of what I venture to characterize as one of the oldest and most important of extant manuscripts of several of Cicero's orations. This announcement was received in some quarters with considerable scepticism, and it was not till I brought out in 1907 a new edition of the text, embodying in the critical apparatus the result of my discovery, that general acceptance was secured, and that scholars everywhere, even in Germany, gave in their adhesion to the views thus promulgated.² It seems open to me, therefore, in publishing a second edition of the Oxford text, to speak now of a hypothesis which has received verification, and of a theory that has been converted into fact.

There is no more romantic chapter in all literary history than the search for classical manuscripts that went on in the 14th and 15th

¹ Anecdota Oxoniensia, Classical Series, Part IX.

² See Hall's Companion to Classical Texts 1913, page 220.

centuries of our era. Take Petrarch (1314-1374) for example; he specialized on Cicero, to whom he actually wrote the first of his "Letters to Dead Authors." Wherever Petrarch went on his travels, he always had in mind the possibility of discovering some of Cicero's lost writings, and he never drew near to, or even caught a glimpse of, some secluded monastery, without hastening to the spot full of expectation that there he would find the fruition of his hopes. Petrarch realized that the classical works known to him and his contemporaries formed but a small part of the great literature that had existed in former days. When asked what his object was in these endless journeyings, he might have replied in the words of a famous contemporary, "I come to awaken the dead." That was the keynote of the early Renaissance.

Petrarch was a link between the mediaeval and the modern world: he describes himself as "placed on the confines of two peoples, and as looking backwards as well as forwards." After him came Boccaccio, and in the next century, Poggio (1380-1459). It is through Poggio that we begin to approach the Benedictine Monastery of Cluni, which he is known to have visited in the year 1415. Poggio acted as Papal Secretary at the Council of Constance (1414-1418) and as he had nothing to do while the Apostolic See was vacant, he made these years an opportunity for much foreign travel,—Cluni 1415, St. Gallen 1416, Langres and other places in France and Germany, 1417. From Cluni he is known to have carried off a manuscript of certain speeches with which I am not going to deal in this paper, but which we are now certain must have been No. 496 in the old Cluni catalogue.

Poggio's manuscript has entirely disappeared, and our knowledge of it rests only on certain excerpts. My luck was actually to find and to identify the great codex which was No. 498 in the same catalogue, and which must therefore, have stood alongside of Poggio's when he made his visit to the Monastery.

The celebration of the thousandth anniversary of the foundation of the great Abbey of Cluni took place only a few years ago,—in 1910. Its institution, therefore, takes us back to the year 910, and the manuscript which I am describing was probably one of its earliest treasures—a prized possession of the Library which grew to be one of the most valuable features of the great Monastery. It is interesting to recall the fact that till the building of St. Peter's at Rome, the Cluni Abbey was the largest in Europe. The ideal of its foundation was that of a "great central monastery upon which depended a multitude of religious houses spread over many lands and forming a vast feudal hierarchy." By the 12th century Cluni is known to have had no fewer than 314 monasteries dependent on it in France, Italy,

Spain, Lorraine, England, Scotland and Poland. By the 15th century, the number had grown to 825. It was under the rule of Peter the Venerable, the friend of St. Bernard, that this great Benedictine foundation attained to the zenith of its prosperity, say in the middle of the 12th century. Immediately on his death, a catalogue was compiled (1158-1161) of the books in the Library, and it is by the help of this catalogue that it has been possible to make with complete assurance the identification of which I am speaking to you.

When the manuscript first came into my hands, I happened to notice on the first folio a little dot of black ink, which I thought might conceal a library mark. It was a not uncommon practice in former times—and one which unjust borrowers of books sometimes imitate even now—to obliterate any trace of former ownership by erasing such marks of identification. On applying a chemical re-agent to this particular writing, letters were revealed which I was able to read as “de conventu clun’.” There was some difficulty about the third word, and it might have been a matter of dispute to the present day, were it not for the fact that the same library mark turned up afterwards in Paris, when it was read with absolute certainty as “Clun’ ” = “Cluniacensi.” Moreover there was the old catalogue, in which under No. 498, the compiler gave a statement of the contents which was almost exactly applicable to the manuscript I am describing. It is written in the simple, round orderly hand called “Carolingian minuscule” because it derives from the great Emperor Charlemagne, being in fact his contribution to the revival of letters in his day and generation. This script is emphatically a “bookhand,” and may be regarded as the direct precursor of our printed type. For us it is interesting to recall the fact that Charlemagne was helped in his endeavours after a correct and legible script by the Englishman Alcuin of York, who became Abbot of the great Monastery of St. Martin at Tours (796-804). Tours was one of the chief centres from which, beginning with the commencement of the 9th century, there issued a wonderful series of great manuscripts written, like the one now under consideration, in the reformed Carolingian hand. This hand became the literary script of the Frankish Empire, in succession to what we know as the Roman semi-uncial hand, and it was because it came to be generally adopted in neighbouring countries that it is now recognized as having been the fore-runner of our own Roman type.

This Cluni manuscript is now in Lord Leicester’s Library at Holkham in Norfolk. It takes its place among the score of manuscripts still in existence which we are led by internal evidence to ascribe to the School of Tours, or at least to copyists connected with that School.

The question may now be asked, what gain, apart from the romance of this discovery and identification, accrues to the text of Cicero by the emergence of this codex? The answer is that it plays an important part in the improvement of the text. The early printed editions of the classical authors were taken as a rule from any manuscript that happened to be convenient for the purpose. Many of these were contemporary manuscripts of the 15th century, full of so-called corrections by Italian copyists, and presenting many features of contrast to the purer tradition that is to be found in codices of an earlier date. In this fact lies a vindication of modern critical methods. It furnishes, in fact, the justification in many cases for the bold treatment of a degenerate text, from which the critic rejects what he considers obviously to belong to some collator and not to the original author. Secondly this manuscript throws a flood of light on the interrelationship of many extant codices. In its journeyings it passed from Cluni to the Low Countries, was consulted by many editors and critics, and has left its mark, without any previous revelation of its source or authority, on many printed editions. The Cluni codex must be regarded now as the primary basis and foundation of all the texts which it contains. The importance of this statement will be recognized when it is remembered that the great German editor, Halm, used no fewer than 40 manuscripts on which to found his text of Cicero's Speeches against Catiline; and this manuscript of ours takes precedence of every one of Halm's manuscripts in respect both of age and of authority. In addition to most of the Catiline Speeches, it contains part of the Speeches against Verres. These Speeches were originally published in seven books. For the 6th and 7th our best authority is a great codex at Paris, pretty nearly contemporary with ours. Ours contains books IV and V although in a very mutilated condition; and as I have elsewhere shown the direct connection which exists between the Paris Codex and another manuscript, also in Paris, containing the earlier books, the criticism of all the Verrine orations may now be said to have been placed on a sound basis; we can now, in fact, like Cuvier with his skeleton, reconstruct the complete archetype from which these other manuscripts have been derived.

Sometime after the 12th century, the Cluni manuscript was stolen, in all probability, from its original home, and the mark which it bore on its front page was carefully erased. This cannot have been later than the year 1562 when the Abbey of Cluni was sacked by the Huguenots. In the effort to trace its subsequent history, it is well to note that collators, like Cujas, may have had access to it; some various readings cited by him occur nowhere else than in this Cluni Codex. Cujas (1522-1590) was the greatest French jurist of

his day. He belonged to Liège, and it seems not improbable that Liège was the first resting place of the Cluni manuscript after it had started out on its travels. Its later history may be connected with the three letters of the alphabet, N. F. and M., as they are used in the great critical edition of Cicero's Speeches by Baiter and Halm.

N stands for Nannius, which is the Latin name for Pierre Nanning of Louvain; ob. 1557. Nanning reports various readings from a Codex which he calls 'aureus libellus',—a golden book, and these various readings were at once accepted by contemporary editors, and were finally incorporated in the text of Lambinus. I can now state with certainty that the Cluni Codex is the manuscript from which these variants were taken.

F stands for Fabricius which is the Latin name for Schmidt (of Düren; ob. 1573). This Schmidt supplied Lambinus with variants for his epoch-making edition, and these were added after Lambinus's death, in the margin of the second issue of that work, always with the reference, —V.C. (=Vetus Codex). The source of these various readings can now be stated to have been the Cluni Codex.

M stands for Metellianus, a Codex owned by Jean Matal (1520-1597) and used also by another collator called Gulielmius. To each of these the text of Cicero is under great obligation, and it was for a long time contended that they must have used different manuscripts. It can now be shown, however, that both used the same manuscript, and that this was the Cluni Codex.

The formula which may now be adopted with confidence is accordingly:

N. F. M. = C.

The Cluni Manuscript is, however, now in a very mutilated condition. It is in fact only a shadow of its former self,—a thin and greatly emaciated volume instead of a lordly and bulky codex, like its sister of Paris. But here again good luck followed the effort to restore it by the help of its progeny. The portion which is most defective is that which formerly contained a complete version of two of the books into which the Speeches against Verres are divided. Scholars had already noted that a certain manuscript of the 15th century, now at Florence (Lg. 42), while setting forth for the rest of these speeches a text by no means above the average, contained for these particular books a tradition that was easily recognized as something older and more free from corruption. This part of the manuscript in question can now be shown to have been copied directly from the Cluni Codex while it was still intact, so that although the latter is now merely a fragment, we are able to restore the missing parts from this transcript, and can readily understand now why the tradition

of this part of the 15th century manuscript at Florence has always been recognized as of such surpassing worth.

This completes the story of a manuscript which played a most important part in the purifying of Cicero's text,—acting, as it were, as a sort of secret agent through the centuries, which has only now been recognized and brought to light. As already stated the manuscript passed from the Low Countries to Lord Leicester's Library at Holkham in Norfolk. It may be of interest to add that when I published at Oxford the edition of the text of the Verrine Orations, in which the results of this identification were embodied, I sent a copy to the representative in Montreal of that Church which has always maintained the use of Latin as a living language. From Mgr. Bruchesi I had the pleasure of receiving an acknowledgement couched in the Latin language, and expressed with so much classical grace that I may appropriately end this paper by quoting, as follows:—

Marianopoli, die 30a Ianuarii 1908.

Paulus Archiepiscopus,

Domino Gulielmo Peterson,

Rectori universitatis Macgillianae, salutem.

Non tua te quidem fefellit sententia existimantem nemini antiquius esse quidquid ad latinas litteras pertineat quam mihi qui et ab oratione latina meam quasi a fonte repeto et eam colere non desino ut Ecclesiae propriam. Dum autem ea quae me totum detinet episcopatus sollicitudine prohibeor quin amatis studiis vacem, quomodo tibi non gratuler tot irretito negotiis et Benedictinae eruditionis ac diligentiae haeredi! Hanc quippe modestam laudem non respuet qui Cluniacenses divitias, ne loquar de Vaticanis, suas fecit et mire quam expolivit. Eximiam namque eximii libri revolvendi praefationem succurrebat ultro quod de grammatica dixit Augustinus: "unum nomen, sed res infinita, multiplex, curarum plenior, addit sanctus doctor, quam iucunditatis," tuae dico equidem, non aliorum, non nostrae. Laborum enim spe quibus desudasti ipsum illimem fontem ad nos usque perducis. Nec quisquam melius de re litteraria meretur quam qui praeclarissima humani ingenii opera purgatis mendis veluti discussis nebulis primae reddit integritati.

Gratias itaque magnas ago pro honore quo me, non te, affectisti, mittendo libro qui inter lectissimos mihi reponetur; et tibi beneficii perpetuo memor omnia fausta, prospera, adprecari perget amicissimus homo fidelissime.

†PAULUS BRUCHESI

archiepiscopus Marianopolitanus.

The Poetry of To-day.

By ARTHUR L. PHELPS.

Presented by PELHAM EDGAR, PH.D., F.R.S.C.

(Read May Meeting 1916).

There is an uninstructed kind of pleasure in which almost every age indulges itself. It is the pleasure obtained from saying: our age is the worst in the history of the world; of all times ours is the wickedest, most sordid, the least unrelieved by greatness and genius. This is a melancholy sort of pleasure indeed. Yet it is the indulgence throughout their lives of multitudes of people who, even though they do not admittedly honour them, accept the dictums of the cynics and the preacher-puritans. Quite the most unfortunate form of this pleasure is that form of it which pities and deplores the dearth of poetry and the poetic feeling. When an age is enjoying its lack of poets it has fallen near to the most unmitigated conditions of commonplace. Of course every age survives its own disparagement. Every age is better than its cynics and its preacher-puritans would have all believe. But how unhappy the misfortune which separates a generation from its own greatness and genius, which makes it acknowledge greatness and genius only amid the glories of the past or in the dreams of the future. We honour Shelly and Wordsworth as great ones of the past; we imagine that in some far off future golden age other poets will be born. How devastating it is to our spiritual life to believe that there is no fine ecstasy to-day. Yet this is just what most of us do believe; and we believe it with an unthinking dull acquiescence which possesses most of the characteristics of spiritual stupidity.

It is not the presumption of these pages to attempt to prove that we have Shakespeares or Miltons or even Tennysons to-day, or that our age is as rich as one age was in its gift of the Divine revelation. But it is the purpose of these pages to suggest that our age is not without that old imagination which makes men and women children of the Kingdom of Heaven, and that it is not without its prophets of that spiritual order. Some of these prophets are voices crying in the wilderness; some are working in our modern carpenter shops and attending our wedding feasts. They are talking to us in terms of our every day of things other than the things of every day. They

are glorifying the limits in which our every day life is set and they are also manifesting that vast kingdom of which our life here is but a provincial subdivision. May I quote here a poem by Francis Thompson called "The Kingdom of God":

"O world invisible, we view thee,
O world intangible, we touch thee,
O world unknowable, we know thee,
Inapprehensible, we clutch thee.

Does the fish soar to find the ocean,
The eagle plunge to find the air—
That we ask of the stars in motion
If they have rumour of thee there?

Not where the wheeling systems darken,
And our benumbed conceiving soars.—
The drift of opinions, would we hearken,
Beats at our own clay-shuttered doors.

The angels keep their ancient places:—
Turn but a stone and start a wing.
'Tis ye, 'tis your estrangèd faces,
That miss the many-splendoured thing.

But (when so sad thou canst not sadder)
Cry;—and upon thy so sore loss
Shall shine the traffic of Jacob's ladder
Pitched betwixt Heaven and Charing Cross.

Yea, in the night, my Soul, my daughter,
Cry;—clinging Heaven by the hems;
And lo, Christ walking on the water
Not of Gennesareth, but Thames."

"'Tis ye, 'tis your estrangèd faces, that miss the many-splendoured thing." That is the line to pause upon for the immediate purpose of this writing. The words are from a modern poet who died practically unhonoured in 1907. He was a Voice crying in the wilderness. Only since his death have many listened to his truth and fire. Recently his publishers have slapped their pockets, but only recently. "'Tis ye." That is the poet's indicting finger. You, the modern public, by your docile servility to facts, by your stupid blindness, by the hardness of your practical hearts, you have missed the "many-splendoured thing." The age is not little and sordid and wrong. You are little and sordid and wrong, that is what the poet would say.

Many causes prosper by the richness of their propagandist's vocabulary. Not so long ago we saw the real estate agent marching with banners; his literature flew in every wind. That ubiquitous midsummer perennial, the peripatetic book agent, scatters his wares with words. The modern advertizer, zealous for his cause, furthers it by using a full page in the most widely-read newspaper. But not so may the cause of poetry be advanced. The worth of poetry cannot be demonstrated in dollars and cents. You cannot prove that a love of poetry will mean a bigger annual business turn over and a larger margin. On the contrary, you may have to admit in honesty that it may mean less business. You imagine of course that it will mean more life. But life is not what people are after; they are after business. So you are discredited. And it comes about that the difficulties in the way of being a propagandist for poetry are almost insurmountable. Poetry does not lend itself to propaganda. It is like sunshine. No one has as yet thought of a way of commercializing it. And until that happens it is difficult to talk about it.

Yet, in spite of all this wise argumentation it will be considered truth that there is virtue to-day in attempting to be the propagandist of things spiritual. The propagandist of things material has apparently had it too much his own way for a long time. But after the earthquake and the mighty rushing wind comes the still small voice. The world of to-day is readier to listen to that voice than it has been for a number of generations. When the reality that we have called the world is breaking into the dust of chaos we hearken for tidings of another form of reality, more enduring and, to our new mood, more satisfactory. Even the politician among us becomes a poet and visions a land, his own land, real yet invisible to the physical eye, above the battling armies; and the maker of munitions is a dreamer. We are being made over. We are coming to apprehend the greatness and genius of our own age and to consider our own spiritual values. This makes it easier to plead for poetry, not, it is true, as a thing of commercial worth in the generally accepted sense of the term,—Mr Noyes has essayed that task and failed at it—but as a thing which is the very stuff of life. The world has done business for a long period of time. It is nearly ready again to live for awhile. It is ready for poetry.

So I begin the discussion of the poetry of to-day. I wish to show that our age is imaginative and creative and really awake in the world of the poet's reality; that it will become still more brightly awakened; and that there are many living poets to act as our awakeners, emancipating us from the dull realm of slumber.

I made mention above of the loud and self proclaiming materialist. We hear him and see him everywhere. He is in our real estate offices, in the offices of our trust companies, he sits on our railway boards, he is among our bankers, on the platforms of our political and socialistic gatherings, on our recruiting platforms, in our pulpits, in our ditches—everywhere. She is also in our kitchens. The materialist is everywhere. And this is a good thing because it is a necessary thing. Men and women must be interested in the material of this life, absorbingly, entrancingly interested in it. On the northern half of this hemisphere men and women must especially be wedded to the interest in the material of the earth. We in Canada are young as a nation; we have often been informed of the fact. We must bind a continent to ourselves with hooks of steel. We must hack mountains and dismember streams and seas. Railway systems must be organized, transportation facilitated. We must wrestle with the gigantic might of prairie seasons and tame their fury to a productive peace. We must build houses and skyscrapers and organize industry and make land precious. This may seem a blatantly western doctrine. It would not consort well with certain Oriental philosophies. But it is the doctrine in which we must believe on this continent if we are to save our Western souls. It is Christianity itself that would make us thus aggressive and optimistic concerning the material. But it is Christianity also, carried to its fruition, which would make us call this kingdom of the material in which we labour the kingdom of God, which would make us see

“...the traffic of Jacob's ladder
Pitched betwixt Heaven and Charing Cross.”

and

“...Christ walking on the water
Not of Gennesareth but Thames.”

Our materialism is right. Always it is right, else why the world at all? But we are wrong when we call life itself materialistic, when we condense personality and life and spirit down into the sod of the real estate agent and leave it there, or vaporize it away with the steam of the transcontinental locomotive and let it go there. It is in the sod of the real estate agent. It is in the steam of the locomotive. But it is elsewhere also. That is the secret to be cherished, without which we see no traffic on Jacob's ladder because we see no ladder. Materialism is only dangerous when we allow it to be so, when we allow the word to limit us, when we make of the word a millstone about our spiritual necks. It is surely quite a proper thing to be

materially and commercially minded if materialism and commercialism are defined and limited with sufficient care, and seen to be only part of a whole truth about life. Jacob's ladder has two ends. He who is unaware of this interesting fact would properly think any climbing on it foolishness. But the angels are not foolish. If we listen to the preacher-puritan who tells us that our souls are dead or to the cynic who informs us that we never had a soul, there is only one end to our ladder and it will not be long before we also walk with the dull dead multitude who know no traffic with Heaven. All the while the age and its glories and its "many-splendouredness" will go on about us, vital, eager, palpitant, creative, spiritual. Only we, having eyes, see not, and, having ears, hear not, and, having hardened our hearts, neither do we understand.

In a word or two the contention made in the above discussion is simply this: that the phenomenon of our age which we call its materialism and commercialism is a good and salutary thing. All that we need is the eye and heart to see it and understand it so. We can never estimate properly the spiritual values of our time until we disabuse ourselves of wrong notions about our "materialism," our so-called sordidness, our "commercialism". Commercialism and materialism like all other things will remain a menace to many other values in life so long as the majority of us continue to regard them wrongly. When we understand them rightly and relate them properly they are our rich heritage. This is Christianity. It is only the man who says that the age is solely materialistic who has no other spiritual values to which to relate his interest in the material. It is only he who has "gained the whole world."

In order to come nearer to the ultimate subject of discussion it is well now to outline more carefully concerning materialism and our commercialistic age what has already been adumbrated. Viewed properly and relatively the so-called materialism of our industrial expansion is an expression of an aggressive vitality, a nervous, eager, fine spirit of accomplishment and optimism. There is no wisdom and much unnecessary despair in deploring the dearth of the artistic sense in a generation and in complaining about the cold stillness of imagination's wings. The same spirit, differently manifested in degree and manner, gave us the Bible and Shakespeare and our modern skyscrapers and that sinuous, insatiable steel which we call our railroad lines. Passion and ecstasy and imagination is alive in this age. Let anyone but stride abroad in the wind and stress of the world's materialistic weather and he will find it out. John Masefield and Wilfrid Gibson have found it out. They tell us about it with startling vividness. They aver that there is intensity and passion

and that fine ecstasy which is life in our machine shops, in our railroad yards, in our tramp steamers abroad on the seas of commerce, in our offices, in our slums, and in our mansions of the rich. And this intensity and passion and ecstasy—whether it be in terms of love or hate or social indignation or pain or the slow horror of the dying poor, or the red sins of the rich—this intensity and passion and ecstasy is poetry latent and manifest. It is spiritual ardour to be extricated, emancipated by the writer of poems that our age may know itself and learn a reverence for its own life and a control over it. Yonder mechanic swung far out tense into blue air and bright sunshine with a hand grip and a hammer stroke at a skyscraper's top is a poet. But who will tell us what he thinks, who he is, amid the vitalities of this vital generation of to-day. We need the writer of poems and poetry to do that for us.

When we thus allow to the poet his function there is no longer stigma and limitation in our materialism, and all our industrial enterprises are on the way to becoming spiritual achievements.

In reality poetry is everywhere latent and manifest. Indeed, the appeal of the propagandist need only be for the seeing eye. Poetry, once seen, discovered, is its own proclamation. It commends itself. The task of the lover of poetry among those who do not appreciate its ministry is not to describe and extoll. It is rather simply to introduce. This is the great goal to be arrived at, to come to the sense that all life is poetry, that the Divine ardour is everywhere. Once this is felt poetry is indeed in all places and the writers of poems are simply those of us so worthily endowed that they see further than we see, and are able to assist our inadequate vision and to open our holden eyes. They aid us in the seeing of what has been kept secret from the foundation of the world.

I live in a rural community on the shore of the Bay of Quinte. One day of wind we drove for eight miles along that shore to our village. At a turn of the road and where it slipped down close to the water two black horses were startled from drinking and went galloping away down the wind. Eight ducks sat squat in a row on the foamy pebbles. They remained unmoved where the horses had been. On certain mornings certain green fields bordering the amber water are white with thousands of gulls. Once we saw four schooners driving into the cove out of storm. Sometimes in the evening we see a ship go by with all sail set and with three or four gulls following it on slow wings. I dreamed the other night that someone showed me a lot of things that have wonder about them. Among them were: wet roofs and pavements under your city street lights; a V of wild geese flying over a city with honking clangour; a grass

blade on a sandy sea shore blown in the wind; a child playing in the slums (and then a child playing in a summer meadow with daisies); street cars full of people, a tree in a storm, and a man walking. Now I ask you to feel with me as I feel concerning these things, as we felt that day driving along the windy shore of the Bay of Quinte seeing the wild horses and the still ducks. Who but the writer of poems can say for us the ultimate word about all these things? The writer of poems alone can come nearest to telling us what our vague uneasiness about them means. He can usher us into the realm of which they are a symbol for he lives in that realm and knows it. He extricates meanings for us from that dim precious country where so much of our significant life is stored away. It is this view of the poet as one who extricates, delivers, emancipates upon which I wish specially now to remark.

I believe the true poet lives in a land where lie all the significances of this everyday world and life of ours. He is a sojourner amongst us here but his citizenship is in that other country. And now and then he gives us messages of the fullness of whose meaning he himself is unaware because he is, among us, human. He speaks for the Divine in measure as did Christ the greatest of poets in fullness. He is a Voice of that vast reality which lies about every one of us, of whose existence in spiritual ecstasy we are at times vaguely aware. A phrase suddenly is in the air before his eyes. As it is studied it yields meaning slowly, as a rainbow examined manifests hues. But just as often, I think, the poet knows immediately whereof he speaks. He realizes the freighted meaningful weight of his own words. Then it is that we, if we listen carefully to his speech, will have revelations of many things. We shall discern with sympathetic insight into human moods; we shall see a flower, and a sky, and feel an understanding intimacy with them. A street turn in a small town will be full of meaning by virtue of what a poet said. Here is a poem by T. E. Brown called "Dora:"

"She knelt upon her brother's grave,
My little girl of six years old—
He used to be so good and brave,
The sweetest lamb of all our fold;
He used to shout, he used to sing,
Of all our tribe the little king—
And so unto the turf her ear she laid,
To hark if still in that dark place he played.
No sound! No sound!
Death's silence was profound;
And horror crept
Into her aching heart, and Dora wept.
If this is as it ought to be,
My God, I leave it unto Thee."

There is something we want said and the poet has said it for us. The question as to why we want it said has as much profundity about it as the question why the world. I leave it utterly alone. As I take it for granted that we live and love life, I take it also for granted that we yearn to express that life, to put it into what we call words, to tell it to ourselves and to one another. The poet helps us to attain to this end. He extricates our aspirations. He displays our moods. He makes our indignations, our hates, our sympathies, our loves, our desires, our ambitions, our despairs articulate. We try, we desire; he achieves. And he does this because expression is an end. Our spirits achieve a tranquility when we have put into our own terms some wonder, when we have possessed in the net of our words that wonder. And each time that we attain to this tranquility by the aid of the writer of poems we attain to a new refinement of sensibility; there is a further widening of our spiritual horizons.

I have tried now to show that this age of ours is awake and imaginative and creative if we will but see the fact. I have suggested the function of the poet and his poetry in assisting us in that work of seeing. I have called him our emancipator and the one who extricates meanings for us from the more or less chaotic pile of life. Now I wish to indicate that the age is about to become or is becoming more brightly awakened, that we are readier than for many generations to have the poets speak to us.

To some minds all this talk may seem, when we are living under the strain of great and demanding times, unfeeling, even like callous indifference to the needs of the hour. But not so. Any words that in any degree can re-create the sense of spiritual values in life and that can serve to introduce us to poetry are salutary and wholesome. Because a love of poetry means a cleansing of the mind, a clarifying process in which aspirations are pointed and ideals are burnished. We need this cleansing of the mind to-day. We need it that we may maintain our sanity and be steady and strongly capable for the need of our next hour. We need to-day spiritual experience. We need a new birth into life. The poet will make life for us, and he will lead us into it. The enemy of life is the obsession with facts and with what pays and is practical. The poet will deliver us out of the hand of that enemy.

We are indeed ready for deliverance. It is coming. Not by a way which we would have chosen, but it is near at hand and the poet is the supreme deliverer. The price of victory and the penalty of defeat in this war alike will shatter the smug affluence of our prosperity. A shifting of values is about to take place, is now taking place to the thunder of guns. A new aristocracy is rapidly arising. It is the

aristocracy of simplicity and of spirit. The poet in the new order of society will be the wealthy man. He who can live on a crust with his dreams will be the envied one. I do not believe I am talking in hyperbole and metaphor. In the days of the social collapse which will follow the war the poet among men will become the man of calm, honoured and envied; he will tramp the roads and walk the lanes of this fair Canada of ours and, with his crust of bread keeping physical existence together, he will live in the country of his dreams singing on our troubled earth the songs of that country. The rest of us, or those who shall be the rest of us, will be wistful for his happiness and be very ready to learn his songs, not because they are published in green and gold cloth and well advertized by a reputable publisher, but because they come from his heart and our heart desires his heart's secret. In those days the only book that will be published will be that one which is well worth publishing in terms other than dollars and cents. It will not be announced by flaming wrappers and heralded by huge headlines in the journals of the multitudinous press. There will not be the means at hand for the heaping of that indignity even if the books which can tolerate it could be offered to the public. We shall be cultured again by adversity. In those days no books will be published but those published in plain boards and with careful printing because some man loves them for themselves and has a faith that some other man will love them too, deeming it a precious thing that there are yet in the strange world believing minds and singing hearts.

Now in this new day that is coming,—indeed that is almost here—poetry will be esteemed very precious and much good poetry will be written. We are in the dawning of that day already. We are about to re-create our poets by loving them. Authentic singers have been with us all along. We have not listened as we ought to have listened because we have been deaf. We have not seen as we ought to have seen because we have been blind. We have disparaged our poets and in measure stultified them. One of our prominent editors said the other day in a letter: "I have to confess that in Canada we do not seem to think much of poetry." But now we are turning to the poet. It is not without significance that a little volume called "Poems of To-day" should be issued and heralded in England and find a sale in Canada in a war year, a little volume not of clamorous popular verse which is nearly always welcomed and always is an anaesthetic to the spiritual aspirations of the crowd, but a volume of real poetry made out of life for life by poets who are the emancipators of our age and whom we have neglected to honour.

The slight volume called "Poems of To-day" indicates the presence of poets in our generation. But these new poets have many

and strange manners. Including those outside the pages of "Poems of To-day" and those within, the throng of them is a motley one. There are some with old love on their lips and many with new hate on their lips. Their music is often a broken sort of music sounding strangely. Some of them will not be nicey nice and smoothey smooth and sweetly sweet as they aver their fathers were. They will denude beauty to the flesh and make her march naked. Even hate and horror they will strip of its conventional dressing. These are the poets whose verses are acrid as a road side plum and hard as a wild walnut and as virile as all wild things. We confess that we do not like these poets very well. Perhaps if we make careful inquiry of ourselves we shall find that it is because they perform their office of discoverer to us of life too carefully. Some things of course we want said; but there are many other things better left unsaid. These wild poets insist too much. They speak too plainly. For some of us there is no music in plain speaking—at least no low music sweet and hushed which we have heretofore been accustomed to associate with poetry. These modern young men, so they say, would disabuse us of our notion that poetry is only sweet and easy, something for the lover's lane and the cradle. John M. Synge told us that poetry must become brutal before it can be true again. But we can shut our ears to all such as these and yet find poets who perform musically their office of deliverer and extricator of life. The volume "Poems of To-day" is full of the work of these latter. Indeed, it is difficult to discover in the careful pages prepared for the English Association any indication that there is another sort of poet. The collection would have been more representative had it contained work by Gibson, and Ezra Pound and even Richard Aldington. There may have been good reason for omitting these names but it is not readily apparent.

When we begin to awaken to the fact of the existence of a modern poetry, when we realize that our age is creative and imaginative, that our industrialism has its aesthetic side and that even our materialism is romantic, the community of poets to which we are suddenly introduced is indeed a varied one, more varied, as has been suggested than the fine volume put out by the English Association would lead one to suppose. There are "cults of the modern" and "schools" and "tendencies" in abundance. The whole may be superficially divided into four main groups. There is the group made up of those poets who are wedded to the high standards and traditions of the main line of the development of the poetry of the past. There is the group composed of the Mystics and the Symbolists. There are the "Realists" and the "Imagists."

Robert Bridges the Laureate may be placed in the first group, possibly as its honoured dean. He shares with R.L.S. the honour of having more poems than any of the rest in "Poems of To-day." Indeed, the impression the Laureate gives, seen among his contemporaries of his school, makes the volume seem like a conspiracy to enthrone him. There is a chaste civility about his work and a cool perfection, a wrought excellence of phrasing that flatters us continually with the possibilities of our English tongue. This civility and perfection and excellence has merit and charm standing by itself but it becomes a specially pleasant and salutary influence after the hardness and cruelty of a Gibson or the riot of a Masfield. This poem is indicative of the Laureate:

"I found to-day out walking
The flower my love loves best.
What, when I stooped to pluck it,
Could dare my hand arrest?

Was it a snake lay curling
About the root's thick crown?
Or did some hidden bramble
Tear my hand reaching down?

There was no snake uncurling,
And no thorn wounded me;
'Twas my heart checked me, sighing
She is beyond the sea."

The fact may be but indicated that there exists a definite body of English poets,—and of course throughout this writing the discussion is limited to such—who may be best designated, when we feel under the necessity of designating them at all, as mystics and symbolists. Symbols are the landscape of the country in which mysticism dwells so these two go together. Our mystic poets are symbolists and our symbolists are mystics. William Bulter Yeats and "A.E." (George Russell) are the names I shall mention. Both men are very practical mystics and very incorrigible dreamers. They distress by their vague subtleties even their would-be followers and they alienate the multitude. They are not "popular" poets. Yet they are immaculate craftsmen and their work leads us, if we give them the attendance of understanding learning which they demand, into that realm of the supersensible and the vaguely beautiful which, with its cloudy glories, is our home. Of the following two poems the first is by Yeats and the second by "A.E."

THE EVERLASTING VOICES.

"O sweet everlasting voices be still;
Go to the guards of the heavenly fold
And bid them wander obeying your will
Flame under flame, till Time be no more;
Have you not heard that our hearts are old,
That you call in birds, in wind on the hill,
In shaken boughs, in tide on the shore?
O sweet everlasting Voices be still."

DUST.

"I heard them in their sadness say
'The earth rebukes the thought of God;
We are but embers wrapped in clay
A little nobler than the sod.'

But I have touched the lips of clay:
Mother, thy rudest sod to me
Is thrilled with fire of hidden day,
And haunted by all mystery."

For the pomp of circumstance and the shocks and the material reality of the world we turn away from these mystics to the work of Gibson and Masfield. The two names are sufficient to indicate the trend of their group. Their subject matter is all the smelly detail of a ship at sea, the curses of a poacher's fight or the whirring of wheels in a factory and the poverty of the poor. These men are called realists. The word is used unfortunately, for the mystic deals in realism just as much as does the realist. But the word is a convenient one. When we use it I suppose we pay tribute to an old philosophic theory and mean that such and such a man is a realist because he deals in "matters of fact," in materially real terms. Especially if he deals with poverty and danger and vice is he a realist because those things are our most patent matters of fact in a yet unregenerate social order. The realists are performing a necessary function for us to-day. They are revealing to us many things. They are really doing what Elizabeth Barrett Browning is reported to have done from her languishing chair in her "Cry of the Children." To-day, because we live in a more tremendous and shocking age, our modern champions of the soul must be tremendous and shocking. A perusal of their pages will extricate for us and deliver into our hands much that was otherwise unknown, much that it is well for one to know who is possessed of a citizen's soul.

The Imagists are difficult people. O. W. Firkins writing in the pages of the New York "Nation" has found them so. The anthologies have not as yet been able to handle them. Their unconventionality is too incorrigible and anthologies must preserve at least the appearance of a classic demeanour. Perhaps the argument for this whole contention concerning the poetry and poets of to-day is the right and proper argument in favour of the imagists. I had thought of saying it at the beginning and I say it now at the end, that herein I have not been attempting to lead away from the classics. On the contrary the attempt has been to indicate the road of return to the classics, to those classics whose work has become the soul of this planet and without which we cannot live. I am indicating the road of return, for I believe that a kindled interest in poetry of to-day with its rapture and desire will prompt the wish to understand the poetic moods and revelations of other generations. A love of poetry in one generation is a love of poetry in all generations. The love of poetry once properly aroused will want to embrace at the last all the poetry in language. Now the work of the imagists may not be poetry in many strict and accustomed senses but it has its poetic rapture and its sincere passion. These qualities are valid currency for the spirits of all ages. The contention for the poetry of to-day and for the cult of the modern lies in this: that a reaction in the spirit of a man may be achieved more readily through the impact of a modern poet's revelation dealing with things modern than in any other way. One of the great functions of the poet should be that he reveals his own generation to itself. The other day I read a poem of Tennyson's to an intelligent and well read young farmer. He shook his head. I read Masefield's "The Everlasting Mercy." His eyes kindled when I finished. So I say if the imagists by means of or in spite of their insistence upon icy clarity and hard statuary nudity, are upon a "modern" subject matter, and can kindle our raptures and arouse any stirring of the moods let us welcome them. Let us wish that the English Association had welcomed them also. They might allow their group to be represented by the following by Richard Aldington:

NEW LOVE.

"She has new leaves
After her dead flowers,
Like the little almond tree
Which the frost hurt."

In Canada we are making our own beginnings of interest in poets and poetry. We have had among us some half dozen men and

women fragments of whose work has gone to the making of poetic literature, and whose lines are suited to refine our sensibilities and ennoble our moods. A number of representative collections have been brought together. While these may not have indicated the possession on our part of any special degree of the schooling of technical understanding or of the culture of artistic restraint, they at least proclaim us as having a willing and a singing heart. Of the publication among us of individual volumes there has been no end. But these volumes for the most part have worked against rather than in favour of the awakening of that creative and imaginative life for which this writing pleads. They have not been authentic poetry even by the kindly test of these pages. They have most often been an untutored display of unschooled moods which has led the "Saturday Night" to exclaim "Poor Mary!" or "Poor Willie!" as the case might require. Mr. Stringer it is true, gave us a preface to his last volume "Open Water." That is a good thing. It indicates that we are beginning to think about our verse making. Both people and poets among us are, consciously or unconsciously, forming an ideal for the poet and honouring his function sufficiently to make demands upon it. This fact may seem to be discredited by the daily appearance of poor work upon the editorial pages of certain of our newspapers, but, examined closely, there are gleams of hope apparent even in that. From time to time there is at least sincere rapture and real passion. That is promising. I think the day of the long artistically wrought poem will return because interest in the long poem will return. Interest in the written poem for the sake of its high function, its power to extricate and reveal and express the poetry of life will come again. The people are going to discover in themselves during these passionate days of the world's life a stirring of the spirit and a desire for poetry, an uninstructed and misguided desire with unfortunate and inadequate definitions of poetry it may be, but nevertheless a real desire and one gradually to be tempered by schooling and culture. That will react upon our poets. Whitman says:

"To have great poets
there must be great audiences too."

There is truth in it.

*Place-Names in the Rocky Mountains between the 49th Parallel and the
Athabaska River*

By JAMES WHITE, F.R.S.C.

(Read May Meeting, 1916)

As the writer was assistant to the late Dr. George M. Dawson during his explorations in the Southern Rockies in 1884, and to Mr. R. G. McConnell in the same region in 1885, he thus acquired personal knowledge respecting the derivation of many of the place-names of this region and these data have been incorporated in this paper.

For a proper understanding of these names and the circumstances attending their naming a brief statement of the principal explorations is given below.

In 1807, David Thompson crossed the Rockies by the Howse pass. He descended the Blaeberry to its mouth, thence up the Columbia to its source and down the Kootenay. In the area under consideration, practically the only name that he contributed was Lussier river, named after one of his men.

Though the pass bears his name, Joseph Howse did not travel through it till 1810. Howse was a writer in the employ of the Hudson's Bay Co., and wintered in 1810-11 near site of present Kalispell, Montana. This is noteworthy as the only attempt by the Hudson's Bay Co. to compete with their great rivals, the North-West Co., in the country west of the Rockies.

Although Arrowsmith's map of North America was the best geographical authority respecting the region, the 1824 edition contains only ten names in the area included in this paper. This is a measure of the information available ninety years ago respecting place-names in the area under consideration.

Devil's Nose of Arrowsmith's map is the present Devil's Head, Pyramid mountain can not be identified and King mountain, just south of the 49th parallel, is now Chief mountain. The map also included seven names of rivers, viz: (1) Moo-coo-wans, now the Belly, (2) Spitchee, now Highwood, (3) Hokaikski, probably present Fish creek, (4) Hopikski, probably present Elbow river, (5) Bow or Askow, (6) Red Deer and (7) Saskatchewan, present North Saskatchewan. The Athabaska river in and near the Rockies is shown as a tributary of the North Saskatchewan and is designated "N. Branch."

The "Kootenac" Indians are noted as occupying the western portion of the Rockies from Athabaska pass southward; the "Snare" Indians' territory evidently included the upper Athabaska river and the "Stone" Indians were on the North Saskatchewan near fort Edmonton. The foregoing is interesting as proof of the accuracy of Dr. Dawson's deductions respecting the recent immigration of the Stoney into the Rockies, referred to on page 506.

In 1841, Sir George Simpson crossed the Rockies but did not name any features except present Minnewanka lake which he named Peechee after his half-breed guide. Simpson's name was, later, attached to the pass by which he crossed the Atlantic-Pacific watershed and to the river flowing westward from the summit of this pass. Berland creek in Sinclair pass was named by Dr. G. M. Dawson after the half-breed who met Simpson at the west end of the pass.

In 1845, the famous missionary, Father De Smet, crossed the Rockies but did not name any features. He erected a cross on the Pacific-Atlantic watershed. His trip was commemorated by Dr. Dawson in (1) Morigeau creek, after a French-Canadian who met De Smet near the source of the Columbia river, (2) In Cross river, a tributary of the Kootenay and which is a translation of the Stoney name, "the river where a white man set up a cross," (3) White Man pass, which commemorates the fact that De Smet traversed it.

In 1857, Capt. John Palliser was instructed to explore "that portion of British North America which lies between the northern branch of the River Saskatchewan and the frontier of the United States and between the Red River and the Rocky Mountains." He was also instructed "to ascertain whether one or more practicable passes exist over the Rocky Mountains within the British territory, and south of that known to exist between Mount Brown and Mount Hooker."

In 1858 and 1859, explorations were made in the Rockies by Capt. Palliser, Dr. Hector and Capt. Blakiston, R. A. Special credit should be given to Dr. Hector for his excellent work and to him is due practically all the accurate geographical data in the Rocky mountains contained in the maps accompanying the report of the expedition. By a curious fatality, he examined all the passes but the best, the Yellowhead, which, although noted on his map, was not explored because his instructions explicitly limited him, on the north, to the Athabaska pass.

The members of the Palliser expedition were immortalised in Palliser river, after the commander, mount Bourgeau, after the botanist and Sullivan peak, after the Secretary and Asst. Astronomer. The omission of the names of Dr. (later, Sir) James Hector, the unassuming geologist, and of Capt. Thos. Blakiston, R.A., magnetic

observer, was repaired in 1884, when Dr. Dawson attached their names to prominent peaks. As Blakiston quarrelled with Palliser and refused to obey his instructions, his surveys were only partially incorporated in the general map of the expedition.

The Palliser expedition named mountain ranges after Capt. Brisco, of the 11th Hussars and Mr. Mitchell who were on a hunting trip and accompanied Palliser on some of his journeys.

Peaks were named after four Presidents of the Royal Society, Maj. Gen. Sabine, 1852-53, Rev. T. R. Robinson, 1849-50, Sir Chas. Lyell, 1864-65, and Sir Roderick Murchison, 1846-47. Mountains were named after John Gould, British naturalist, John Hutton Balfour, Scottish botanist, David Forbes, Scottish geologist, John Goodsir, Professor of Anatomy, Edinburgh University, Francis Galton, English scientific writer and African explorer, the famous David Livingstone, missionary and African explorer, Sir John Lefroy, scientist and founder of the Meteorological Service of Canada, John Ball, Under Secretary of State for the Colonies, Sir Edmund Head, then Governor General of Canada, after Dr. John Rae, Sir George Back and Sir John Richardson, Arctic explorers, after Stanford, the English geographer, Rundle, a missionary who laboured among the Stoneys, and Archdeacon Hunter, Red River colony.

Kananaskis is the name of an Indian of whom there is a legend giving an account of his most wonderful recovery from the blow of an axe which had stunned but failed to kill him. Crowsnest mountain, pass, river, lake and railway station do not commemorate a slaughter of Crow Indians in a corner or "nest" as set forth in local tradition but only a commonplace occurrence, viz., the nesting of crows near the base of the peak.

In 1859, the Earl of Southesk entered the Rockies from the headwaters of the McLeod; thence, by the Rocky, Brazeau and North Saskatchewan waters, he made his way southward to the Bow river. He added some geographical data respecting the Brazeau.

In 1863, Lord Milton and Dr. Cheadle crossed the Rockies by the Yellowhead pass and descended the North Thompson. Their interesting narrative was wholly the work of Cheadle and the accompanying map supplements the Palliser Expedition map.

In the late summer of 1882 and in the seasons of 1883 and 1884, Dr. Geo. M. Dawson made explorations in the Rockies between the 49th parallel and lat. 53°. A few names given by him have already been referred to. His surveys were, for various reasons, much more accurate and detailed than those of his predecessors. In addition to naming numerous features, he identified nearly all the peaks and

ranges named by the Palliser expedition. In 1885, the writer extended the surveyed area in the Rockies, to the North Saskatchewan river.

In 1884, the British Association met in Montreal and, later, the Canadian Pacific provided transportation to the 'end of steel,' near present Field station. Mount Temple was named after Sir Richard Temple, the, then, President of the Economic Science and Statistics section of the British Association. This magnificent peak is near mount Lefroy, named after Maj. Gen. Lefroy who, by a curious coincidence, was, then, President of the Geographical section of the Association.

Mount McDougall is after the famous Methodist missionary who laboured among the Stoneys and after his sons, David and Rev. John McDougall. Healy creek is after Capt. J. J. Healy who, in 1884, was prospecting for copper in the mountains opposite Castle station. Van Horne range, after Sir William Van Horne, General Manager, later, Chairman, of the Canadian Pacific. The magnificent peak, mount Assiniboine, after the Assiniboines or Stoneys, who claim, as their hunting grounds, the Rockies from the United States border to the watershed between the North Saskatchewan and Athabaska.

Three peaks, McConnell, Tyrrell and White, bear the names of Dr. Dawson's assistants in 1882, 1883 and 1884, respectively.

Reference need not be made to descriptive names such as Wind, Grotto, Hole-in-the-wall, Storm, Mist, Misty, Blue, Tombstone and many others which are either descriptive of the feature or of conditions existing at date of exploration.

Dr. Dawson named peaks after Thomas Drummond, Naturalist to the second Franklin expedition, 1825-27, and after David Douglas, a Scottish botanist who crossed the Rockies by the Athabaska pass in 1827. Mt. Verendrye is after the famous French explorer and mount De Smet after the missionary whose travels in the Rockies have already been referred to. Mount Selkirk is, of course, after Lord Selkirk, founder of the Red River Colony. Wi-suk-i-tshak range and Oldman river are after the "Old Man"—Wi-suk-i-tshak—of the Crees, a mythical character, with supernatural attributes familiar under one name or other, to all students of American folklore. The name of the Oldman river in Cree is *Is-e-enoo-met-ewe-win-si-pi*; in Stoney, *Is-sa-goo-win-ih-ska-da-wap-ta*. Fortunately, neither of these names has passed into common use.

Of the railway stations on the main line of the Canadian Pacific railway, Banff, Duthil, Leancoil and Canmore were named by Lord Strathcona or Lord Mount-Stephen after localities near their birth-places. Donald is named after Lord Strathcona and Stephen is after George Stephen, Lord Mount-Stephen, sometime President of the Canadian Pacific; Hector and Palliser are after two members of the

Palliser expedition. Field is after Cyrus Field of Atlantic cable fame. Moberly is after an engineer employed on exploratory work in the Rockies and Selkirks in the early 'sixties' and 'seventies.' He discovered Eagle pass and western portion of Rogers pass.

In June, 1886, the Canadian Pacific railway was opened. This stimulated exploration by giving easy access to the mountains.

From 1886 to 1892, J. J. McArthur was engaged upon photo-topographical surveys of the mountains in the vicinity of the main line of the Canadian Pacific and westward to long. $116^{\circ} 10' W$. (approx.). From 1888 to 1892, W. L. Drewry was engaged upon triangulation in the same region and topographical work in the Crowsnest district.

In 1893, W. D. Wilcox and S. E. S. Allen made reconnaissance surveys in the region adjoining and to the westward of the area surveyed by McArthur and Drewry. Later, Wilcox extended his explorations northward to the Athabaska waters.

In 1894 and following years, Prof. Chas. E. Fay, Philip Abbot, C. S. Thompson and G. M. Weed of the Appalachian Mountain Club, Prof. H. B. Dixon, Prof. J. N. Collie, G. P. Baker, H. E. M. Stutfield, Rev. Jas. Outram and Edward Whymper of the Alpine Club, Jean Habel of Berlin and many others were attracted by the numerous unclimbed peaks and untrodden valleys. In 1892 and 1893, Dr. A. P. Coleman explored between Morley and the Athabaska pass and determined the altitude of mounts Brown and Hooker to be about 10,000 feet, instead of the 16,000 to 17,000 they had hitherto been credited with. In 1902, he explored the valley of the Brazeau river.

Messrs. Wilcox, Stutfield, Collie and Coleman added much material to existing maps. So far as the region between the Red Deer river and the North Saskatchewan was concerned, however, it had all been mapped by the writer though it remained unpublished until 1909 when it was incorporated in a map of the Rockies published by the Dept. of the Interior.

From 1900 to 1907, A. O. Wheeler was engaged upon a photo-topographical survey of the mountains between the western limit of the surveys by McArthur and Drewry and the Columbia river. In 1911, he made a similar survey of the Mount Robson region.

In 1913, the delimitation of the boundary between Alberta and British Columbia was begun near the 49th parallel. In connection with it a photo-topographical survey of the Rockies east of the watershed to approximate latitude $51^{\circ} 28' N$. has been made.

The foregoing review is merely a sketch of the principal explorations in the southern Rockies and does not pretend to narrate them in detail.

Referring to the remarkable paucity of Indian names, Dr. Geo. M. Dawson says: **"It is a remarkable circumstance that the Stoney Indians attach definite names to very few of the features in the region, whether mountains or rivers. As these Indians are known to be recent immigrants, and to have occupied the district for about 40 years [since about 1840] only, the paucity of names might be supposed to be accounted for by this fact. The Stoneys, however, have since incorporated with themselves the families of Mountain Crees who formerly hunted here, and many of the names which can be ascertained are either Cree or their equivalents in Stoney. I am, therefore, led to believe that the Crees themselves had come comparatively recently into possession of the region, from which they expelled some hostile tribe, probably of the Kootanie (Kootenuha) stock. This supposition finds confirmation in the statement of the missionary, De Smet, who says that, some years previous to the date at which he wrote (1849), the Crees and Assiniboinés inhabiting the Athabaska region had been forced to move southward, owing to the scarcity of game, in search of buffalo. It may probably have been at about this time that the Crees pushed their way into this part of the mountains. The present tribe of Rocky Mountain Stoneys (or Assiniboinés) is known to be related to the Athabaska Assiniboinés. These, according to De Smet, separated from the main body of the same people to occupy the Athabaska region about sixty years before 1849, or in 1790.*

"More detailed enquiry among the Kootanie people than I have been able to make, might settle the question as to their former territorial claims. It is certain, however, that tradition relates constant feuds and repeated raids across the mountains between the Kootanie and the Blackfoot tribes, and that the former have been accustomed from time immemorial to cross to the eastern plains to hunt buffalo. It is also probable from the habits of the Blackfoot people, who are essentially plain Indians, that they would not willingly inhabit for any length of time these mountain fastnesses."

**Preliminary Report on the Physical and Geological Features of that portion of the Rocky Mountains, between Latitudes 49° and 51° 30', by George M. Dawson, Geological and Natural History Survey of Canada, Vol. I, 1885, Part B, pp. 12-13.*

NOTE—A few features in the foothills and north of the Athabaska river have been included. The names of such features are distinguished by an asterisk. For place-names in vicinity of the Athabaska river, see also *Place Names in Vicinity of Yellowhead Pass*, by James White, in *The Canadian Alpine Journal*, 1914-1915.

A

Abbot; pass, Bow river, Alta. and B.C.; after Philip Stanley Abbot, member of the Appalachian Mountain Club, Boston, who met his death on the steep slopes of mount Lefroy, 1896.

Aberdeen; mountain, Bow river, Alta.; after the Marquess of Aberdeen and Temair, Governor General of Canada, 1893-98.

Agnes; lake, Bow river, Alta.; after Susan Agnes, Baroness Macdonald of Earnscliffe, who visited the locality in 1886.

Agnew; creek, Kootenay river, B.C.; after J. M. Agnew, owner of land traversed by the creek.

Akamina; pass, Alta. and B.C., and brook, Waterton river, Alta.; Indian name meaning "high bench land," referring to the benches near summit of South Kootenay pass.

{ †***Alberta**; province; after H.R.H. Princess Louise (Louise Caroline Alberta), b. 1848; m., 1871, Duke of Argyll (then Marquis of Lorne). Alberta was created a provisional district, 1882; erected into a province, 1905; the Marquis of Lorne, Governor General, 1878-83, wrote the following:

"In token of the love which thou has shown
For this wide land of freedom, I have named
A province vast, and for its beauty famed,
By thy dear name to be hereafter known."

{ **Alberta**; mount, Athabaska river, Alta. and B.C. (Stutfield and Collie)†

Alderson; mount, Oldman river, Alta.; after Maj. Gen. Alderson, commanding the Canadian Expeditionary Force in France, 1915-16.

Aldridge; creek, Elk river, B.C.; after W. H. Aldridge, M. E., general manager of the Consolidated Mining and Smelting Co., Trail; had charge of development of coal in vicinity for Canadian Pacific Ry.

Alexander; creek, Michel creek, B.C.; after J.S.T. Alexander, late Government Agent, Fernie, B.C.

Alexandra; mount, Columbia river, B.C. and Alta.; after Queen Alexandra. (Stutfield and Collie)

Alice; lake, Bow river, Alta.; named by Rev. H. P. Nichols after his wife, since deceased.

Allison; mount and creek, Crowsnest river, Alta.; after late Douglas Allison, formerly in the Mounted Police; settled on this creek.

Amiskwi; peak, river, pass and falls, Kicking Horse river, B.C.; Cree Indian for "beaver."

Anderson; mount, Waterton river, Oldman river, Alta.; after Major S. Anderson, R.E., Chief Astronomer of the second Boundary Commission (49th parallel) and also a member of the first Boundary Commission.

Andygood; creek, Michel creek, Elk river, B.C.; after late Andrew Good, hotel proprietor.

†*Bracketing the names indicates that the name was originally applied to the first name only and that, later, it has been applied to the other features.

†To avoid repetition of 'named by,' the name of the person who named the feature is, in many instances, inserted in brackets at the end of the description.

- Annette;** lake, Paradise valley, Bow river, Alta.; after Mrs. Astley, wife of the manager of the Lake Louise chalet. (Wilcox)
- Anthracite;** railway station, Bow river, Alta.; anthracite coal formerly mined in vicinity.
- Arce;** lake, Bow river, Alta.; expansion of the Bow (*q.v.*) river. (Bourgeau)
- Armstrong;** creek, Columbia river, B.C.; after Capt. F. P. Armstrong; he had a ranch at this point; in 1886, built and ran the *Duchess*, the first steamboat on the upper Columbia river.
- Assiniboine;** mountain, Spray river, Bow river, Alta. and B.C.; named by Dr. Dawson, 1884, after the Assiniboine (Stoney) Indians, who hunt in the Rockies from the 49th parallel to the watershed between the North Saskatchewan and Athabaska.
- Athabaska;** river, pass, glacier, mount and lake, Alta.; an Algonquin Indian word signifying "place where there are reeds," referring to the delta of Athabaska river where it falls into Athabaska lake.
- Athalmer;** village, Columbia river, B.C.; a Saxon word signifying "most noble;" named after Hon. F. W. Aylmer, whose surname is derived from Athalmer.
- Avens;** mount, Baker creek, Bow river, Alta.; after a wild flower, the campion.
- Ayesha;** peak, Blaeberry river, B.C.; "crest of the mountain resembles a beautiful face turned upwards and, owing to the wild surroundings, suggested the name" of the heroine in Rider Haggard's *She*.
- Aylmer;** cañon and mountain, Bow river, Alta.; after town of Aylmer, Que. (McArthur)

B

- Babel;** mount, Bow river, Alta.; fancied resemblance to Tower of Babel.
- Back;** mount, Palliser river, B.C.; after Admiral Sir George Back, Arctic explorer. (Palliser)
- Baker;** lake and creek, Bow river, Alta.; after a prospector, prospected in vicinity, 1882 or 1883.
- Baker;** mount and pass, Yoho and Blaeberry rivers, B.C.; after G. P. Baker, member of the Appalachian Mountain Club, Boston. (Collie)
- Balfour;** mount, Bow river, Alta. and B.C.; glacier, Alta.; mountain named by Hector after John Hutton Balfour (1808-84), botanist, Edinburgh, Scot.
- Ball;** mount and pass, Bow river, Alta. and B.C.; after John Ball (1818-89), Under Secretary of State for the Colonies, 1855-57. (Hector)
- Banff;** town, Bow river, Alta.; after Banff, town, Scotland, which is a corruption of *Bunaimb*, 'the mouth of the river.' Named by Lord Strathcona, after his birthplace.
- Bankhead;** village, Cascade river, Bow river, Alta; after Bankhead, Banffshire, Scotland. (Strathcona)
- Bare;** mountains, Red Deer river, and hills, North Saskatchewan river, Alta.; descriptive.
- Bath;** creek and glacier, Bow river, Alta.; creek named July 20, 1881, when Major Rogers, of the Canadian Pacific engineering staff, took an involuntary 'bath' in it, when thrown from his horse. Named "Noore" creek by Hector, but name now obsolete.
- Baynes;** lake and post-office, Kootenay river, B.C.; after Andrew Bain, who located land on the lake in 1896.
- Beaver;** lake and creek, Oldman river, Alta.; from translation of Blackfoot Indian name *kak-ghik-stakiskway*, 'where the beaver cuts wood.'

- Beaverfoot**; river and range, Columbia river, B.C.; Dawson says that it is a translation of Stoney Indian name of the river.
- Beehive**; mountain, Livingstone river, Oldman river, Alta.; descriptive.
- Bellevue**; railway station, Crownsnest river, Alta.; descriptive.
- Belly**; river and mountain, Oldman river, Alta.; after the Atsina, a detached branch of the Arapaho, now on a reserve in Montana; are known to the other Arapaho as *Hitúněna*, 'beggars' or 'spongers' whence the tribal sign, commonly, but incorrectly, rendered 'belly people' or 'big bellies'; the 'Gros Ventres' of the French Canadians and now their popular name. The river was, formerly, called 'Mokowanis,' also 'Mokomans.' *Mokowanis* is Blackfoot for 'belly.'
- Berland**; creek, Columbia river, B.C., after Edward Berland, the guide sent from the Hudson's Bay Co.'s post at fort Colville to meet Sir Geo. Simpson with a relay of horses, 1841.
- Biddle**; mount and pass, Kicking Horse river, B.C.; after M. Biddle, who climbed mount Sir Donald in 1902.
- Bident**; mount, Bow river, Alta.; resembles a double tooth.
- Bighorn**; creek and range, North Saskatchewan river, Alta.; translation of Indian name; in earlier days these mountains were noted hunting grounds for the bighorn.
- Bingay**; creek, Elk river, B.C.; after a Canadian Pacific railway employee.
- Blackwater**; creek, Columbia river, B.C.; descriptive.
- Blaeberry**; river, Columbia river, B.C.; after the blaeberrys that are found in abundance on the banks of the stream. (Hector)
- Blairmore**; town and creek, Crownstest river, Alta.; after two railway contractors, Blair and More (or Moore).
- Blakiston**; brook and mountain, Waterton river, Oldman river, Alta.; after Lieut. Thomas Blakiston, R.A.; attached to the Palliser expedition as magnetic observer; examined the North Kootenay and South Kootenay passes; quarrelled with Palliser and made an independent report.
- Blaylock**; creek, Elk river, B.C.; after S. G. Blaylock, M.E., Consolidated Mining and Smelting Co., Trail; sometime, in charge of Canadian Pacific Ry. Co.'s development of coal in vicinity.
- Bleasdell**; creek, Elk river, B.C.; after A. W. Bleasdell, who located coal measures in vicinity.
- Blue**; mountain, Spray river, Alta. and B.C.; from blue appearance when seen from a distance.
- Bluewater**; creek, Columbia river, B.C.; descriptive.
- *Boat Encampment**; abandoned post, Canoe river, B.C.; at this point, David Thompson, 1811, built the canoes that carried him to the Pacific.
- Bonnet**; peak, Bow river, Alta.; descriptive of summit of mountain.
- Boom**; lake, Bow river, Alta.; the driftwood dammed against a shoal resembled a lumberman's boom.
- Boom**; peak, Bow river, Alta. and B.C.
- Bosworth**; mount, Bow river, Alta. and B.C.; after G. M. Bosworth, 4th Vice-President, Canadian Pacific railway.
- Boulder**; creek, Kicking Horse river, B.C.; descriptive.
- *Boule Roche**; mount, Athabaska river, Alta.; a descriptive name.
- Boundary**; mountains, Waterton river, Alta. and B.C.; from their situation near junction of boundaries of Alberta, British Columbia and United States.
- Boundary**; pass, Waterton river, Alta. and B.C.
- Bourgeau**; mount, Bow river, Alta.; after E. Bourgeau, botanist to the Palliser expedition, 1857-60. (Hector)

- Bow**; river, Alta.; the wood which grew on the bank of the river was suitable for the making of bows; translation of Cree Indian name, *manachaban*; called "Askow" river on Arrowsmith's map, 1810.
- Bow**; peak, pass, range and lake, Alta.; the lake is called *Mi-nis-ne-im-ne* in Stoney, *Os-kow-wioo-si'-pi'-sa-ga-he-gun* in Cree, meaning Coldwater lake.
- Brachiopod**; mountain, Baker creek, Bow river, Alta.; its "west slopes are literally covered with brachiopods and fossil corals." (Porter)
- Brazeau**; range and river, North Saskatchewan river, Alta.; after an officer of the Hudson's Bay Co.; in charge of Rocky Mountain house during Hector's explorations in the Rockies, 1858-59. (Hector)
- Brazeau**; lake, Brazeau river, Alta. (Coleman)
- Brett**; mount, Bow river, Alta.; after R. G. Brett, M.D., Lieut.-Governor of Alberta.
- Brewster**; creek, Bow river, Alta.; after a well known camp outfitter, Banff.
- Brisco**; range, Columbia river, B.C.; after Captain Brisco of the 11th Hussars, a friend of Capt. Palliser; accompanied Palliser during his explorations in the summer of 1859. (Hector)
- Brisco**; post office, Columbia river, B.C.
- Broadwood**; mount, Elk river, B.C.; after Lewis Broadwood, an English sportsman, who lived here some time hunting and fishing.
- *Broken-Leg**; lake, Bow river, Alta.; translation of Indian name.
- *Brown**; mount, Athabaska pass, Alta. and B.C.; named by David Douglas "in honour of R. Brown, Esq., the illustrious botanist"; Robert Brown (1775-1858), famous British botanist.
- Brûlé**; lake, Athabaska river, Alta.; presumably referring to burnt timber on its shores.
- Bryce**; mount, Columbia river, B.C. and Alta.; after Viscount James Bryce, the then President of the Alpine Club, London, Eng.; British Ambassador at Washington, 1907-12. (Stutfield and Collie)
- Burgess**; mountain and pass, Kicking Horse river, B.C.; after the late A. M. Burgess, Deputy Minister of the Interior.
- Burmis**; railway station, Alta.; after two residents, Burns and Kemmis.
- Bush**; pass, Alta. and B.C., and peak and river, Columbia river, B.C.; after the dense forest (bush) on the banks of the river.
- Butwell**; mount, Kicking Horse river, B.C.; after Frank Butwell, firewarden at Leancoil; his cabin is at foot of peak. (Allen)

C

- Caithness**; railway station, Elk river, B.C.; probably after Caithness, county, Scot.
- *Caledonian**; valley, Miette river, Alta. and B.C.; the valley of the Miette and upper Fraser rivers was formerly so called because it was traversed by the Hudson's Bay Co.'s trail to New Caledonia (present British Columbia between lats. 51° 30' and 57° 00'). Name now obsolete.
- Cameron**; lake, brook, mountain, and falls, Waterton river, Alta.; after Maj.-Gen. D. H. Cameron, British Commissioner on International boundary, lake of the Woods to the Rockies, 1872-76; accompanied Hon. Wm. Macdougall, first Lieut.-Governor of Manitoba, as far as Pembina, 1869.
- Canalflat**; railway station, Kootenay river, B.C.; after an unused canal between the Kootenay and Columbia rivers. Formerly 'Grohman' after Baillie-Grohman who constructed the canal.
- Canmore**; town, Bow river, Alta.; after Kenmore village, Argyllshire, Scotland, which from the Gaelic *ceam mor*, 'big head,' orthography changed in error.

***Canoe;** river, Columbia river, B.C.; named by David Thompson, explorer; at its mouth, 1811, he built the canoes that carried him to the Pacific.

Cañon; creek, Oldman river, Alta.; descriptive.

{Carbon; river and hill, Oldman river, Alta.; after coal outcroppings in vicinity.

{Carbon; creek, Elk river, B.C.

Carnarvon; mount, Kicking Horse river, B.C.; named by A. M. Burgess after Earl of Carnarvon (1831-90), Colonial Secretary, 1874-80; acted as arbiter between the Dominion and British Columbia in 1874; his decision is known as the 'Carnarvon terms.' Formerly "McMullen," named by McArthur after his assistant.

Cascade; mountain and river, Bow river, Alta.; from translation of the Indian name, 'Mountain-where-the-water-falls,' which was abbreviated by Hector to 'Cascade.'

{Castle; mountain, Bow river, Alta.; from its resemblance to a series of battlements and turrets. (Hector)

{Castle; railway station, Bow river, Alta.; in 1884, was called Silver City.

{Castle; mountain, Columbia river, B.C.

{Castle; river, Oldman river, Alta.

{Castle Rock; mountain, Ghost river, Alta.

{Cataract; river, Highwood river, Alta.; from the falls on this stream.

{Cataract; brook, Kicking Horse river, B.C.

Cataract; pass, North Saskatchewan river, Alta.; after Cataract (now, Cline) river.

Cataract; peak, Red Deer river, Alta.; after falls in vicinity.

{Cathedral; mountain, Kicking Horse river, B.C.; from its resemblance to a cathedral.

{Cathedral Crags; mountain, Kicking Horse river, B.C.

Centre; peak, Oldman river, Alta.; descriptive.

{Chaba; river, Athabaska river, Alta.; named by A. P. Coleman after beaver dams and cuttings along its course. *Chaba* is Stoney for "beaver."

{Chaba; mountain, Athabaska river, Alta.

Chancellor; peak, Kicking Horse river, B.C.; after Sir John Boyd (1837-1916), Chancellor of Ontario, one of the arbitrators in the case of Canadian Pacific Ry. Co. vs. Crown, in 1886.

Charlton; mount, Maligne river, Athabaska river, Alta.; after H. R. Charlton, General Advertising Agent, Grand Trunk Ry. (Schäffer)

Chauncey; creek, Fording river, B.C.; after an employee of the Canadian Pacific Ry.

{Chimney; ridge, Oldman river, Alta.; descriptive.

{Chimney Rock; mountain, Oldman river, Alta.

***Chiniki;** lake, creek, railway station and hill, Bow river, Alta.; after a Stoney Indian chief.

Christie; mount, Athabaska pass, Alta.; after Chief Factor Wm. J. Christie of the Hudson's Bay Co., who was in charge at Edmonton when the Palliser expedition wintered there, 1858-59. (Hector)

Chungo; creek, Brazeau river, Alta.; Stoney Indian word signifying "trail."

Cirque; peak, Bow river, Alta.; descriptive, the stream from its south front heads in a great 'cirque' or amphitheatre.

Clearwater; river, North Saskatchewan river, Alta.; descriptive.

Cline; mount and river, North Saskatchewan river, Alta.; Hector says that his Indian guide reported a trail up the White Goat river from Kootenay plain to Jasper house, travelled by a trader named Cline, who used it when collecting provisions for the winter; the peak was named by Collie.

- Clode**; creek, Fording river, B.C.; after an employee of the Canadian Pacific Ry.
- Cloister**; mountains, North Saskatchewan river, Alta.; resemble "four fine cathedrals with splendid walls and buttresses on the southwest. We named them the Cloister mountains to match the Minster mountain" opposite them. (Coleman)
- *Coal**; creek, Oldman river, Alta.; coal outcrops along this stream.
- *Cockscomb**; hill, Bow river, Alta.; descriptive of outline of summit.
- Cokato**; railway station, Elk river, B.C.; after the coke ovens at this point.
- Coleman**; town, Crowsnest river, Alta.; after a daughter of A. C. Flumerfelt, President of the International Coal and Coke Co.
- Coleman**; mountain, Crowsnest river, Alta.
- Coleman**; mount and glacier, North Saskatchewan river, Alta.; after Prof. A. P. Coleman who made explorations in the Rockies between the North Saskatchewan and Athabaska.
- Colin**; range, Athabaska river, Alta.; probably after Colin Fraser, a Hudson's Bay Co. officer. (Hector)
- Collie**; mount, Blaeberry river, B.C.; after Dr. J. Norman Collie, who made explorations in the Rockies between the upper waters of the North Saskatchewan and the Athabaska; joint author with Stutfield of *Climbs and Explorations in the Canadian Rockies*.
- Columbia**; river, B.C. and U.S.; first named 'San Roque' by Heceta, 1775; re-discovered 1792, by Capt. Gray, who named it after his vessel.
- Columbia**; mountain and icefields, Columbia river, B.C. and Alta., and glacier, Alta.
- Colvalli**; railway station, Kootenay river, B.C.; an abbreviation of 'Columbia valley.'
- Committee's Punch Bowl**; lake, Athabaska pass, Alta. and B.C.; presumably a reference to the governing committee of the North West Co., who are reputed to have frequently celebrated with the assistance of the flowing bowl.
- Cone**; mountain, Spray river, Alta.; descriptive of outline.
- Connelly**; creek, Oldman river, Alta.; after Connelly Bros., residents in vicinity.
- Consolation**; valley and pass, Bow river, Alta.; valley named by Wilcox as he was "very much pleased with the place" which contrasted favourably with the neighbouring Desolation valley.
- Consolation**; peak, North Saskatchewan river, Alta. and B.C.; named by Rev. (now, Sir) James Outram, because, on climbing this peak, he found the main summit inaccessible.
- Conway**; mount, North Saskatchewan river, Alta.; named after Sir Martin Conway, famous mountain climber; has climbed in Himalayas, Andes, Alps, etc.; President, Alpine Club, 1902-04. (Collie)
- Copper**; mountain, Bow river, Alta.; named by Dawson after copper prospects located near its summit by Healy (*q.v.*) and Dennis (*q.v.*)
- Coral**; creek, North Saskatchewan river, Alta.; after "the many fossil corals among its gravels". (Coleman)
- Corbin**; railway station, Elk river, B.C.; after D. C. Corbin, principal owner of the Eastern British Columbia Ry. and President of the Spokane International Ry.
- Coronation**; peak, North Saskatchewan river, Alta.; named by Collie, "as it was the coronation day of King Edward and Queen Alexandra."
- Corral**; creek, Bow river, Alta.; after a horse corral near mouth during 'construction' days on the Canadian Pacific.
- Costigan**; mount, Bow river, Alta.; after late Hon. John Costigan, Minister of Inland Revenue, 1882-92; Secretary of State, 1892-94; Minister of Marine and Fisheries, 1894-96.

- Cottonwood**; creek, Oldman river, Alta.; after cottonwood trees on its banks.
- Couldrey**; creek, Flathead river, B.C.; after P. Couldrey, mine manager. Formerly, Calder creek; named by Michael Phillipps after a member of the International Boundary Commission which established the boundary line in 1858-62.
- Coulthard**; mount, Crowsnest river, Alta.; after R. W. Coulthard, Calgary, a prominent mining engineer, now (1916), 'somewhere in France.'
- ***Cowley**; village, Crowsnest river, Alta.; named by a rancher, F. W. Godsal; watching his cattle wandering across the prairie, he was reminded of Gray's "lowing herd winds slowly o'er the lea."
- Crandell**; lake and mount, Oldman river, Alta.; the "mountain lies east of oil wells being worked by M. Crandell."
- Crooked**; creek, Oldman river, Alta.; descriptive.
- Cross**; river, Kootenay river, B.C.; Dawson says: "called *Tsha-kooap-tē-ha-wap-ta* by the Stoneys and its name alludes to the circumstance related by them, that some early traveller set up a cross in the pass, not far from the summit." The cross was erected by De Smet (*q.v.*), 1845.
- Crowsnest**; mountain, Alta.; translation of Cree Indian name, *Kah-ka-īoo-wut-tshis-tun*; does not commemorate the slaughter of Crow Indians by the Blackfeet when they got them in a corner or 'nest,' as set forth in local tradition, but merely the nesting of crows near the base of the peak. Name first appeared on the Palliser Expedition map. In a map accompanying Palliser's preliminary report, it is named *Lodge des Corbeaux*.
- Crowsnest**; lake and river, Alta., pass, Alta. and B.C., and railway station, B.C.
- Cuthead**; creek, Cascade river, Alta.; translation of Stoney Indian name; probably refers to story of an Indian who cut his head on or near the stream.
- Cyclamen**; mountain, Oldman river, Alta.; after wild flower.
- Cyclone**; peak, Red Deer river, Alta.; descriptive of storm raging on the peak when named.

D

- Dainard**; lake and creek, Kicking Horse river, B.C.; after Manuel Dainard, "a packer and guide who has done much to open up this portion of the mountains". (Allen)
- Dalhousie**; mount, Brazeau river, Alta.; named by Southesk after "the 11th Earl of that title at whose house my journey to America was first suggested." Cree Indian name is *As-tu-tin-as-sin-wati*, signifying Hat mountain, from its resemblance, when seen from a distance, to a wide-brimmed hat.
- Daly**; mount, Alta. and B.C., and glacier, Yoho river, B.C.; named by Prof. Chas. E. Fay, after late Judge Chas. F. Daly, President, American Geographical Society, 1864-99.
- Deltaform**; mount, Bow river, Alta. and B.C.; from the similarity of its form to the Greek letter Δ.
- Dennis**; mountain and pass, Kicking Horse river, B.C.; after late Lieut.-Col. J. Stoughton Dennis, Surveyor-General, Department of Interior. (Burgess)
- Dent**; mountain, Blaeberry river, B.C. and Alta.; from its resemblance to a tooth.
- Deville**; mount, Kicking Horse river, B.C.; after Dr. E. Deville, D.T.S., Surveyor General of Canada.
- Devils Head**; mountain, Ghost river, Alta.; translation of Cree name '*We-ti-kwas-ti-kwan.*' Sir Geo. Simpson says that it bears "a rude resemblance to an upturned face."
- Devils Thumb**; mountain, Bow river, Alta.; descriptive.

- Diadem**; peak and glacier, Athabaska river, Alta.; the peak is crowned by a 'diadem' of snow about 100 feet high. (Stutfield and Collie)
- Dibble**; creek, Bull river, B.C.; after Jas. Dibble, a prospector; located mines near the head of the creek; drowned in Skeena River cañon in 1909.
- Dolomite**; mountain, pass and stream, Bow river, Alta.; the peaks in vicinity resemble the Swiss "Dolomites."
- Dome**; mountain, Athabaska river, Alta.; from its resemblance to a dome. (Stutfield and Collie)
- Dome**; glacier, Athabaska river, Alta.
- Donald**; railway station, Columbia river, B.C.; after late Donald A. Smith, Lord Strathcona and Mount Royal, member of the Canadian Pacific Railway syndicate; High Commissioner for Canada, 1896 till death in 1914.
- Douglas**; mount and lake, Red Deer river, Alta.; after David Douglas (1798-1834), a Scottish botanist; killed in the Hawaiian islands.
- Doyle**; railway station, Kootenay river, B.C.; after Alfred Doyle, Steele, B.C.
- Drummond**; mount, Red Deer river, Alta.; after Thomas Drummond, Assistant Naturalist in Franklin's second expedition to the Arctic, 1825-27. (Dawson)
- Drywood**; river and mountain, Oldman river, Alta.; descriptive; translation of Indian name of the creek.
- Duchesnay**; mount, lake and pass, Kicking Horse river, B.C.; after the late E. J. Duchesnay, C.E., Asst. General Superintendent, Canadian Pacific Ry.; killed in tunnel near Spuzzum by falling rock, Sept. 4, 1901.
- Dutch**; creek, Oldman river, Alta.; after a prospector, a Dutchman, who "was reputed to have found some very valuable minerals on this stream"; was murdered by his partner.
- Duthil**; railway station, Bow river, Alta.; after Duthil, parish, Inverness, Scot.

E

- Edgewater**; railway station, Columbia river, B.C.; descriptive of position near river.
- Edith**; mount, Bow river, Alta.; after Mrs. J. F. Orde (*née* Edith Cox), Ottawa; visited Banff, with Lady Macdonald, in 1886.
- Edith Cavell**; mount, Athabaska river, Alta.; after Nurse Edith Cavell, judicially murdered by the Germans, Oct. 1915.
- Eiffel**; peak, Bow river, Alta.; from "a huge tower rising for about 1,000 feet to the top of the mountain which suggested the Eiffel tower."
- Elbow**; river, Bow river, Alta.; flows eastward to the 'elbow,' about five miles south of Calgary, then turns abruptly northward.
- Eldon**; railway station, Bow river, Alta.; probably after John Scott, 3rd Earl of Eldon. Possibly after Eildon hall, Banffshire, Scot.
- Elk**; river, B.C.; from the number of elk or wapiti formerly found there.
- Elk**; range, Alta. and B.C.
- Elko**; village, Elk river, B.C.; near Elk river.
- Elk Prairie**; village, Elk river, B.C.; a small prairie in the valley of Elk river.
- Elliott**; peak, North Saskatchewan river, Alta.; after Elliott Barnes who, when only eight years old, climbed this mountain. The name, "Sentinel," given it by A. P. Coleman was discarded as a duplication.
- Emerald**; lake, pass, mountain, creek and railway station, Kicking Horse river, B.C.; the water in the lake is an emerald green.
- End**; mountain, Bow river, Alta.; this peak is at the end of the range.

- Ennis**; mount, Beaverfoot river, B.C.; after the General Manager of the Allan Steamship Co. (Whymper)
- Erickson**; railway station, creek, ridge and mount, Elk river, B.C.; after G. Erickson, sometime, Superintendent, Canadian Pacific Ry., Cranbrook.
- Ernest**; creek, Oldman river, Alta.; after Ernest Ernst; located coal just below the 'gap.'
- Ewin**; creek, Fording river, B.C.; after John Ewing; located coal in vicinity.
- Exshaw**; railway station, Bow river, Alta.; after one of the directors of the Cement company, operating at this point.

F

- Fairholme**; mountains, Bow river, Alta.; named by Hector, probably after Fairholm, seat, Lanarkshire, Scot.
- Fairview**; mountain, Bow river, Alta.; from the magnificent view obtained from its summit.
- Fallen Timber**; creek, Red Deer river, Alta.; descriptive; a translation of the Cree Indian name *kow-ikh-ti-kow*.
- Fatigue**; mountain and creek, Bow river, Alta.; descriptive of explorer's sensations when climbing mountain.
- Fay**; mount, Bow river, Alta. and B.C.; after Prof. Charles E. Fay, member of the Appalachian Mountain Club, Boston.
- Fenwick**; railway station, Kootenay river, B.C.; after a resident.
- Fernie**; town, Elk river, B.C.; after William Fernie, who discovered coal in the Crowsnest Pass coal-field.
- Fiddle**; mountain and river, Athabaska river, Alta.; presumably commemorates some incident in which a violin played a prominent part.
- Field**; railway station and mount, Kicking Horse river, B.C.; after Cyrus West Field (1819-92), promoter of the first Atlantic cable; Field visited the locality in 1884.
- Fish**; lake, Columbia river, B.C.; descriptive.
- Fisher**; creek and mount, Kootenay river, B.C.; after "Jack Fisher, discoverer of gold in Wild Horse creek in the autumn of 1863 on return from prospecting on Findlay creek."
- Fisher**; range, Kananaskis river, Alta.; probably after George Fisher (1794-1873), British astronomer. (Palliser)
- Flathead**; pass, townsite, range and river, B.C.; after the Flathead (Salish) Indians of western Montana; unlike several tribes on the Pacific coast, they do not flatten the heads of their children artificially; the name was probably applied to them because they had some slaves from the coast with deformed heads.
- Foisey**; creek, Flathead river, B.C.; after L. Foisey, fire warden.
- Folding**; mountain, Athabaska river, Alta.; from the 'folding' of the rocks that compose it.
- Forbes**; mount, North Saskatchewan river, Alta.; named by Hector after Prof. James David Forbes (1809-68), Scottish scientist; sometime, principal of the United College of St. Andrews.
- Fording**; river, Elk river, Kootenay, B.C.; named by Dr. Dawson in 1884, because the trail crossed and recrossed it frequently, necessitating fording.
- Forstyth**; creek, Elk river, B.C.; after a Canadian Pacific railway employee.
- *Fortress**; mountain and lake, Wood river, B.C.; peak so named after fancied resemblance to a fortress. (Coleman)
- Fossil**; peak, Bow river, Alta.; "from the numerous fossils in the limestone on its slopes."

Fox; mount, Kananaskis river, Alta. and B.C.; named by Palliser; probably after Lt.-Gen. C. R. Fox, who was on the Council of the Royal Geographical Society in 1860. Possibly after Sir Chas. Fox (1810-74), noted British engineer.

Frances; mount, North Saskatchewan river, Alta.; named by L. Q. Coleman after his daughter, Frances Coleman.

Frank; town, Crowsnest river, Alta.; after Frank, who located coal mines at this point.

Freshfield; mount, North Saskatchewan river, Alta. and B.C., and snowfield, Alta.; after Douglas Freshfield of the Alpine Club. (Stutfield and Collie)

G

Gable; mountain, Elk river, B.C. and Alta.; summit resembles the gable of a house.

Galbraith; creek, Bull river, B.C.; after R. L. T. Galbraith, Indian Agent, Cranbrook, B.C.; resident of the district since 1872.

Galton; range, Kootenay river, B.C.; after Francis Galton (1822-1911), an English scientific writer and African explorer. (Blakiston)

Gap; railway station, Bow river, Alta.; from 'gap' in the Rockies where the Bow river issues from the mountains.

Garnet; mountain, Kicking Horse river, B.C.; after garnets found in the rock.

Gateway; railway station, B.C.; it is near the International boundary and is, therefore, the 'gateway' from the United States into Canada.

Geary; creek, Columbia river, B.C.; after Geo. Geary, owner of ranch on the creek.

George; river, Brazeau river, Alta.; after a man who staked coal claims in this locality in 1907.

Ghost; river, Bow river, Alta.; formerly called Dead Man's river, which from Dead Man's hill; the combatants slain in a battle were buried in the wood on top of the hill.

Girouard; mount, Bow river, Alta.; after Sir Percy Girouard, K.C.M.G., D.S.O.; graduated Royal Military College, Kingston, 1884; Director of Railways, Sudan expedition, 1896-98, and Boer war, 1899-1902; High Commissioner and Commander-in-chief, N. Nigeria, 1907-08.

Glacier; lake, North Saskatchewan river, Alta.; fed by glacier stream.

Gladstone; mount and creek, Oldman river, Alta.; after W. S. Gladstone, an 'old timer' and an ex-employee of the Hudson's Bay Co.; in a saw-pit near Gladstone creek, he rip-sawed lumber; made the windows and doors for fort Macleod.

Glenogle; railway station and creek, Kicking Horse river, B.C.; after glen Ogle, a rocky defile, Perthshire, Scotland.

Goat; range, Spray river, Bow river, Alta.; translation of Indian name. (Palliser)

Golden; town, Columbia river, B.C.; formerly called "Golden City because the settlers wanted to go one better than Silver City," which now called Massive.

Goodsir; mount and creek, Ottertail river, B.C.; after John Goodsir (1814-67), professor of anatomy at Edinburgh University from 1846. (Hector)

Gordon; mountain, Bow river, B.C.; after the family name of Marquess of Aberdeen and Temair.

Gould Dome; mountain, Livingstone river, Alta.; named by Capt. Blakiston, of the Palliser expedition, "after the distinguished British naturalist," John Gould. (1804-81).

Grace; creek, Fording river, Elk river, B.C.; after W. G. Grace, who located coal in vicinity; during the winter of 1893-94, published the "Fort Steele Prospector," the first newspaper in East Kootenay, a weekly, circulation 100, all typewritten six copies at a time.

Grassy; mountain, Crowsnest river, Alta.; descriptive.

Grave; creek, Elk river, B.C.; after two Indian graves near its mouth.

Grease; creek, Red Deer river, Alta.; "so called from the bushes of knotted-leaved birch, which, for some mysterious reason, is named greasewood." Cree name is *to-muna*, Stoney is *sna-tin-da-wap-la*.

Green; hills, Elk river, B.C.; descriptive.

Grotto; mountain, Bow river, Alta.; descriptive; it contains a large cave with high-arched roof, narrow at the mouth. (Bourgeau)

Grundy; creek, Kootenay river, B.C.; after Grunde D'Aarkhus, a Danish prospector.

H

Habel; mount and glacier, Blaeberry river, B.C.; after Dr. Jean Habel, Berlin, Germany; died 1902.

Haddo; peak, Bow river, Alta.; after George, Lord Haddo, eldest son of the Marquess of Aberdeen and Temair.

Hanbury; mount, Kicking Horse river, B.C.; named by Whymper after Cornelius Hanbury, head of the firm of Allen & Hanbury.

Hanbury; post office, Kootenay river, B.C.; after John Hanbury, President, North Star Lumber Co., operating in vicinity.

Hansen; creek and lake, Kootenay river, B.C.; after Nils Hansen who settled at present Wasa in 1886.

Hardisty; mount, Athabaska river, Alta.; after Chief Factor Richard Hardisty of the Hudson's Bay Co., who was in charge at fort Carlton, Sask., when the Palliser expedition wintered there, 1857-58. (Hector)

Harmer; creek, Michel creek, B.C.; after Frank Harmer, prominent citizen.

Harrogate; railway station, Columbia river, B.C.; after Harrogate, fashionable watering place, Yorkshire, Eng.

Hartley; creek, Elk river, B.C.; John Hartley located land at mouth in 1898.

Harvey; creek, Flathead river, B.C.; after J. A. Harvey, lawyer, Cranbrook, B.C.

Haskins; creek, Kicking Horse river, B.C.; after George Haskins, a miner who worked claims in this valley. (Allen)

Haven; creek, North Saskatchewan river, Alta.; after a man who had a grazing lease in this valley.

Haygarth; creek, Kicking Horse river, B.C.; after Wm. Haygarth; formerly lived in a cabin near its mouth. (Allen)

Head; mount, Elk river, B.C. and Alta.; after Sir Edmund Head, Governor General of Canada, 1854-61; Governor of the Hudson's Bay Co., 1863-68. (Palliser)

Healy; creek, Bow river, Alta.; named by Dr. Dawson, 1884, after Captain John J. Healy, sometime, manager of the N.A.T. & T. Company, Dawson, Yukon. Healy and his associates, J. S. and O. Dennis, located some copper claims on a neighbouring mountain.

Hector; mount, Bow river, Alta.; after Dr. (later, Sir) James Hector (1834-1907), geologist of the Palliser expedition, 1857-60; appointed geologist to the Provincial Government of Otago, N.Z., 1861; Director, Geological Survey of New Zealand, 1865 till he resigned in 1907; re-visited scene of his explorations in 1904. (Dawson)

Hector; lake, Bow river, Alta. and railway station, Kicking Horse river, B.C.

Helmet; mountain, Kootenay river, B.C.; descriptive of summit.

Henretta; creek, Fording river, B.C.; after a mining engineer; had charge of Canadian Pacific Ry. Co.'s development of coal measures in vicinity.

Herchmer; mount, Elk river, B.C.; after H. W. Herchmer, Pres., Game Protective Association, Fernie. (Hornaday)

High Rock; range, Elk river, B.C. and Alta.; from the precipitous, rocky character of its summit as compared with the hills near its base.

Highwood; river, Bow river, Alta.; translation of Indian name, *Spitzee*, which so called because the river is on nearly the same level as the prairie instead of in a 'bottom'; as a result, the belt of timber along the stream is much 'higher' than usual and is visible at a considerable distance; called 'High Woods' river by Blakiston.

Highwood; range, Highwood river, Alta.

Hillcrest; mountain and railway station, Oldman river, Alta.; after Charles P. Hill, Managing Director of the Hillcrest Coal and Coke Co.

Hole-in-the-wall; mountain, Bow river, Alta.; from a cave in the side of the mountain; literal translation of Stoney Indian name.

***Hooker**; mount, Athabaska pass, Alta. and B.C.; named by David Douglas "in honour of my early patron the Professor of Botany in the University of Glasgow," Sir William Jackson Hooker (1785-1865), noted English botanist; appointed Director of Royal Botanical Gardens, Kew, in 1841.

Hornaday; mount and pass, Bull river, B.C.; after Dr. John M. Hornaday, director of the New York Zoological park.

Horseshoe; glacier, Bow river, and ridge, Oldman river, Alta.; descriptive.

Hosmer; town and creek, Elk river, B.C.; after Chas. R. Hosmer, Montreal, director of the Canadian Pacific Ry.

Howse; pass and peak, North Saskatchewan river, Alta. and B.C.; after Joseph Howse; in 1810, he crossed the mountains by this pass and travelled southward to near present Kalispell, Montana, where he built a post—the only post west of the Rockies, constructed by the Hudson's Bay Co., prior to the union with the North West Co. in 1821.

Huber; mount, Kicking Horse river, B.C.; after Emil Huber, Swiss Alpine Club; in 1890, Messrs. Huber, Sulzer and Cooper made the first ascent of mount Sir Donald, Selkirk mts.

Hungabee; mount, Bow river, Alta. and B.C.; a Stoney Indian word signifying "chieftain"; name suggested by its dominating appearance as compared with the other peaks in vicinity.

Hunter; range, Kicking Horse river, B.C.; named by Hector; possibly after John Hunter (1728-93), famous Scottish anatomist and surgeon.

Hurd; mount, Kicking Horse river, B.C.; after Major Hurd, a Canadian Pacific engineer who made exploratory surveys up the Kananaskis and other rivers.

I

Ice; river, Kicking Horse river, B.C.; from its rising in the glaciers of mount Vaux; translation of Stoney Indian name *Wash-ma-wap-ta*. (Dawson)

Inglismaldie; mountain, Bow river, Alta.; after Inglismaldie castle, seat of the Earl of Kintore, Kincardineshire, Scot.

Isabella; lake, Siffleur river, Alta.; named by C. S. Thompson after his sister.

Isolated; peak, Livingstone river, Alta., and peak, Kicking Horse river, B.C.; descriptive.

J

- Jacques, Roche;** mountain, Athabaska river, Alta.; probably after a North West Co. or a Hudson's Bay Co. employee.
- Jaffray;** railway station, Kootenay river, B.C.; after late Hon. Robert Jaffray, Vice-Pres. of the Crows Nest Pass Coal Co.
- James;** river and lakes, Red Deer river, Alta.; Cree Indian name, *Ji-mis*; after an Indian.
- Jasper;** lake and village, Athabaska river, Alta.; after Jasper house, a post constructed on lac à Brûlé by Jaspar Hawes, a trader and postmaster in the employ of the North West Co.; later, the post was removed to present Jasper lake. Ross Cox says that, in 1817, Hawes was in charge at Rocky Mountain (Jasper) house.
- Job;** creek and pass, Brazeau river, Alta.; after a "Stoney Indian, Job Beaver, who had worked out the trail" up the valley of this stream. (Coleman)
- Johnson;** creek, Bow river, Alta.; after a prospector of that name, who was here about 1882.
- Jonas;** creek and pass, North Saskatchewan river, Alta.; after Jonas, a chief of the Morley band of Stoneys; in 1893, gave Coleman information respecting trails from North Saskatchewan to the Athabaska. (Coleman)
- *Jumpingpound;** river, Bow river, Alta.; after a buffalo 'pound,' where the buffalo were driven over a high bank and killed.

K

- Kananaskis;** pass, Alta. and B.C., lakes and river, Bow river, Alta.; a correspondent states that it is a corruption of Kin-e-ah-kis, the name of a Cree who was killed beside the river, in a dispute over a woman. Palliser, in his report, says he named Kananaskis pass after "an Indian, of whom there is a legend, giving an account of his most wonderful recovery from the blow of an axe, which had stunned but failed to kill him, and the river which flows through this gorge also bears his name." If Kin-e-ah-kis was not killed, as stated, but made a wonderful recovery, the two statements are not necessarily inconsistent.
- Kananaskis;** post office and range, Bow river, Alta.
- Kaufmann;** mount, North Saskatchewan river, Alta. and B.C.; after Christian Kaufmann, Swiss guide; with Outram when mountain was first ascended. (Outram)
- Kerr;** mount, Kicking Horse river, B.C.; after Robert Kerr (1845-1916), Passenger Traffic Manager, Canadian Pacific Ry.
- Kicking Horse;** pass, Alta. and B.C., and river, B. C.; Dr. Hector, geologist, Palliser expedition, was kicked by his horse near site of present Wapta station; name is abbreviation of translation of name given to the river by Hector's Indians.
- Kikomun;** creek, Kootenay river, B.C.; is Kutenai Indian for 'deer lick'; there are a number of 'licks' on the stream. Mr. C. M. Edwards says: "Formerly known as Old John creek. In the autumn of 1865, 'Old John,' a packer, and a Frenchman camped on its banks. Some other packers arriving, found Old John shot through the head. The Frenchman was insane and never recovered sanity. In 1898, during road improvement, the skeleton, with a bullet hole in the back of the skull, an old revolver and a muzzle loader were found."

Kinbasket; lake, Columbia river, B.C.; named, 1866, by Walter Moberly (*q.v.*) after an Indian chief whom he employed.

King; mount, Kicking Horse river, B.C.; after late Dr. W. F. King, C.M.G., D.T.S., Chief Astronomer of Canada.

Kirby & Spence; mount, Flathead river, B.C.; after William Kirby (1759-1850) and William Spence (1783-1860), entomologists, who collaborated in their professional work. (Blakiston)

Kishinena; mountains and river, Flathead river, B.C.; Indian for 'white fir' or 'balsam.'

Kiwetinok; peak, pass and creek, Kicking Horse river, B.C.; Cree Indian word signifying 'on the north side.'

Kootenay; district, river and lake, B.C.; after the Kutenai tribe of Indians. The Indians inhabiting the lower Kootenay river were often called Flatbows in the earlier histories of the North-West—a literal translation of the name given to them by the French voyageurs in the Fur Company's days.

Kootenay Landing; railway station, B.C.

Kootenay; plains, North Saskatchewan river, Alta.; the Kootenays formerly crossed the Rockies to this point where they met the Indians of the prairies to trade horses, etc.

L

Lake Louise; station, Bow river, Alta.; after lake Louise (*q.v.*), which after Princess Louise.

Lakes; valley of, North Saskatchewan river, Alta.; descriptive; several lakes in it.

Laussedat; mount, Blaeberry river, B.C.; after Col. Aimé Laussedat (1819-1907), member of the Institute of France and President of the Conservatoire National des Arts et Métiers; photography as applied to surveying was first experimented with in 1849 by Col. Laussedat.

Leach; creek, Michel creek, B.C.; after late W. W. Leach, Geological Survey.

Leah; peak, Maligne river, Athabaska river, Alta.; after the wife of Samson (*q.v.*) Beaver. (Schäffer)

Leancoil; railway station, Kicking Horse river, B.C.; Lord Strathcona's mother was Barbara Stuart "of the Manor of Leth-na-Coyle (Lainchoil)," Abernethy parish, Inverness, Scot. (Strathcona)

Lefroy; glacier, Alta. and mountain, Bow river, Alta. and B.C.; after Maj. Gen. Sir John Henry Lefroy (1817-90); he measured the magnetic declination at a number of points in Canada, Cape of Good Hope and St. Helena; with the exception of a short interval, was head of Toronto observatory from 1842-53. (Hector)

Lewis; creek, Kootenay river, B.C.; after Chas. J. Lewis who located a ranch there in 1885; is buried on the bank of the creek.

Lille; mountain and town, Crowsnest river, Alta.; after Lille, France, where many of the shareholders of the West Canadian Collieries Co. reside.

Limestone; ridge, Flathead river, B.C.; composed of limestone.

Linda; lake, Cataract brook, Kicking Horse river, B.C.; after Mdme. Vittorio Sella, wife of noted Italian mountaineer and photographer. (Fay)

Lindsay; mount, Brazeau river, Alta.; named by Southesk after his "friend Sir Coutts Lindsay, Bart., of Balcarres."

Lineham; mount and post office, Oldman river, Alta.; after a rancher.

Little; mount, Bow river, Alta. and B.C.; after M. G. F. Little, one of the party who made the first ascent.

Little Pipestone; creek, Bow river, Alta.; *see* Pipestone.

- Livingstone**; range, Oldman river, Alta.; after David Livingstone (1813-73), famous missionary and African explorer. (Blakiston)
- Livingstone**; mount, river and post office, Oldman river, Alta.
- Llysyfran**; peak, Maligne river, Athabaska river, Alta.; named by Mrs. Schäffer after "a family name" of her companion, Miss Mary Vaux (*see* Mary Vaux).
- Loaf**; mountain, Oldman river, Alta.; descriptive.
- Lone**; mountain, Oldman river, Alta.; descriptive.
- Loop**; ridge and railway station, Michel creek, B.C.; just above the 'loop' in the Canadian Pacific railway.
- Louis**; mount, Bow river, Alta.; after Louis B. Stewart, D.T.S., Professor of Surveying, Toronto University.
- Louise**; lake, Bow river, Alta.; after H.R.H. Princess Louise, fourth dau. of Queen Victoria; b. 1848; m. Marquis of Lorne (later, Duke of Argyll), 1871. (*see* Alberta)
- *Lundbreck**; town, Crowsnest river, Alta.; after Breckenridge and Lund Coal Co., operating collieries there.
- Luxor**; railway station, Columbia river, B.C.; probably after Luxor, a town of Upper Egypt.
- Lychnis**; mountain, Baker creek, Bow river, Alta.; after a wild flower.
- Lyell**; mount, North Saskatchewan river, Alta. and B.C.; after Sir Charles Lyell (1797-1875), a noted British geologist. (Hector)

M

- Macdonald**; range, Kootenay river, B.C.; possibly after Sir John A. Macdonald (1815-90), Premier of Canada, 1857-61, 1867-73 and 1878-91. (Palliser)
- Maus**; creek, Kootenay river, B.C.; after Wm. Maus, an old placer miner, who, when the Wild Horse diggings were exhausted, took up a ranch in vicinity.
- McArthur**; mount, lake, creek and pass, Kicking Horse river, B.C.; after J. J. McArthur, D.L.S., International Boundary Surveys, Dept. of Interior.
- McConnell**; mount, Red Deer river, Alta.; named by Dawson after R. G. McConnell, Deputy Minister, Dept. of Mines; in 1882, was assistant to Dr. Dawson.
- McDougall**; mount, Kananaskis river, Alta.; after Rev. George McDougall and his sons, David and Rev. John McDougall. Rev. Geo. McDougall laboured for many years among the Stoneys and his work was continued by his son John. (Dawson)
- McGillivray**; railway station, Elk river, B.C.; after a contractor on the Crowsnest section of the Canadian Pacific Ry.
- McLatchie**; creek, Flathead river, B.C.; after late John McLatchie, D.L.S.; was "employed by Canadian Pacific railway to run meridian line from Crowsnest station to International boundary line."
- McMurdo**; railway station, Columbia river, B.C.; after Arch. McMurdo, prospector; the first white settler.
- McQuarrie**; creek, Fording river, B.C.; after a Canadian Pacific railway employee.
- Maligne**; river, lake, mountain and station, Athabaska river, Alta.; name originally applied to the river and was descriptive of the difficulty experienced in traversing its valley.
- Margaret**; lake, Bow river, Alta.; after a daughter of Rev. H. P. Nichols, Holy Trinity church, New York. (Thompson)
- Marpole**; mount, Kicking Horse river, B.C.; after R. Marpole, General Executive Assistant, Canadian Pacific Ry., Vancouver.

Mary Vaux; mount, Maligne river, Athabaska river, Alta.; after Miss Mary Vaux "who, like the other members of her family," has taken great interest in the Canadian Rockies. (Schäffer)

Massive; railway station and mountain, Bow river, Alta.; descriptive of mountain.

Merlin; lake, Pipestone river, Bow river, Alta.; at the foot of a mountain which bears a fancied resemblance to Merlin's castle—"a picturesque cluster of tower-like rocks." (Porter)

Michael; peak, Kicking Horse river, B.C.; after Prof. A. Michael, Boston, Mass.; made first ascents of mounts Victoria, Lefroy and Gordon. (Whymper)

Michel; town, creek and mount, Elk river, B.C.; after late Michael Phillipps, Elko, B.C.; came to British Columbia in 1863; clerk in Hudson's Bay Co. post, fort Shepherd, 1864; in charge of H.B. Co. post at mouth of Wild Horse creek, 1865.

Miette; mountain and river, Athabaska river, Alta.; Hector says: "the mountain has only once been ascended from the south side by a hunter, named Miette, after whom it was named."

Miette; railway station, Athabaska river, Alta.

Mill; creek, Oldman river, Alta.; from a mill near mouth of creek.

Minnewanka; lake, Bow river, Alta.; Indian name meaning 'lake of the water-spirit.' The Indian legend runs that: One of the first Indians who saw this lake did so from the summit of one of the highest mountains which surround it. In the lake he saw an enormous fish, so large that, from where he stood, it appeared to be as long as the lake; he, therefore, called it 'The lake of the Evil Water-spirit.'

Formerly called 'Devil's lake,' *M'né-sto*, or 'Cannibal lake' in Stoney; *Ki'-noo-ki'-mow*, or 'Long lake' in Cree. Sir George Simpson named it 'Peechee lake' after his guide, but, as this name had not appeared on any map or obtained any currency, Dawson transferred it to a mountain south of the lake.

Minster; mountain, North Saskatchewan river, Alta.; presents "the imposing walls of cathedral-shaped mountains." (Coleman)

Mirror; lake, Bow river, Alta.; from the reflection in the lake when seen from a great height above.

Misko; creek, Kicking Horse river, B.C.; Cree Indian name, signifying "red."

Mist; mountain, Highwood river, Alta.; from the clouds on the mountain when named by Dr. Dawson in 1884.

Mist; creek, Highwood river, Alta. (Dawson)

Mistaya; river, North Saskatchewan river, Alta.; Indian name meaning "bear"; formerly known as Bear river or Little fork; name changed to avoid duplication.

Misty; range, Highwood river, Alta.; named by Dr. Dawson in 1884, from clouds that covered the summits.

Mitchell; range, Kootenay river, B.C.; after a travelling companion of Captain Brisco (*q.v.*). (Hector)

Moberly; railway station, Columbia river, B.C.; after late Walter Moberly, C.E., who made explorations for the Canadian Pacific railway in the Gold range, Selkirks and Rockies; in 1865, he discovered Eagle pass, and the Illecillewaet valley; established Columbia River depot on site of present station, 1871.

Moberly; mount, Athabaska river, Alta.; after an officer of the Hudson's Bay Co.; in charge of Jasper house when Hector surveyed the Athabaska valley in 1859. (Hector)

- Mokowan**; butte, Oldman river, Alta.; on Arrowsmith's map of 1810, the Belly (*q.v.*) river is called Mokowans river. '*Mokowanis*' is Blackfoot for 'belly.'
- { **Molar**; mount, Bow river, Alta.; "so much resembling a large tooth that we named it mount Molar." (Hector)
 { **Molar**; creek, Bow river, Alta.
- Mollison**; mount, Beaverfoot river, B.C.; after Miss Mollison, sometime Manager, Canadian Pacific hotel, Field. (Scattergood)
- Mons**; railway station, Columbia river, B.C.; after the battle of Mons, August 23, 1914.
- Moraine**; lake, Bow river, Alta.; after the ridge of glacial formation at its lower end. (Wilcox)
- Morigeau**; creek, Columbia river, B.C.; after a French Canadian who, when Father De Smet passed in Sept. 1845, was trapping on the upper Columbia—the only white man for many miles.
- ***Morley**; village, Bow river, Alta.; after famous Methodist clergyman, Rev. William Morley Punshon; name first applied to the McDougall ranch.
- Morrissey**; railway station, ridge and creek, Elk river, B.C.; after James Morrissey who, with Michael Phillipps and John Ridgway, cut out the Crowsnest Pass trail from site of present Elko to Crowsnest lake.
- Mott**; railway station, Elk river, B.C.; after late John Mott, rancher.
- Muleshoe**; lake, Bow river, Alta.; descriptive of outline of lake.
- Mummery**; mount and glacier, Blaeberry river, B.C.; after the late Mr. Mummery, English Alpine Club; perished on mount Nanga Parbat, in the Himalayas. (Stutfield and Collie)
- Murchison**; mount, North Saskatchewan river, Alta.; after Sir Roderick Impey Murchison (1792–1871), Scottish geologist; Director-General of the Geological Survey of Great Britain. (Hector)
- Mutz**; creek, Elk river, B.C.; Albert Mutz operated, at Steele, the first brewery in the district.

N

- Narao**; peak and lakes, Kicking Horse river, B.C.; Stoney Indian, signifying "hit in the stomach."
- Natal**; railway station, Elk river, B.C.; probably after Natal, South Africa.
- Nelson**; creek, Bull river, B.C.; possibly after John Nelson, who trapped on Bull river.
- Neptuak**; mountain, Bow river, Alta. and B.C.; Stoney Indian numeral, "nine"; the ninth of the 'Ten peaks.'
- Newman**; peak, Waterton river, Alta.; after Edward Newman (1801–75), English naturalist. (Blakiston)
- Nez Percé**; creek, Crowsnest river, Alta.; after the Nez Percés, a name applied by the French to all Indian tribes which pierced the nose for the insertion of a piece of dentalium; the term is now applied only to the main tribe of the Shap-tian family, now found in northern Idaho and Oregon.
- Niblock**; mount, Bow river, Alta.; after Superintendent Niblock, Canadian Pacific railway.
- Nicholson**; railway station, Columbia river, B.C.; after a resident.
- Nigel**; peak, North Saskatchewan river, Alta.; named by Stutfield and Collie, after Nigel Vavasour, their guide in 1897.

Nikanassin; range, Brazeau river, Alta.; from Cree Indian, *nikan*, 'in front,' 'first,' and *assin*, 'rocks'; name suggested by the fact that it is the first, or front, range when approaching the Rockies from the east.

Niles; mount, Yoho river, Kicking Horse river, B.C.; after Prof. W. H. Niles, President of the Appalachian Mountain club. (Fay)

Norboe; mount, Elk river, B.C.; named by Hornaday after his guides R. W. and John Norboe.

Norbury; lakes, Kootenay river, B.C.; after F. Paget Norbury, who owned a ranch on the lake shore.

Norquay; mount, Bow river, Alta.; after Hon. John Norquay, sometime Premier of Manitoba.

North Kootenay; pass, Alta. and B.C.; after the Kootenay Indians who, formerly, crossed the Rockies every spring and autumn to kill buffalo, returning with the dried meat which they traded for blankets, etc., with the Hudson's Bay Co. at Kootenay post.

North Saskatchewan; river and glacier, Alta.; from Cree Indian word, *kis-is-ska-tche-wan*, meaning 'swift current.'

Noyes; peak, North Saskatchewan river, Alta.; after Rev. C. L. Noyes. (Stutfield and Collie)

O

Observation; peak, Siffleur river, Alta.; so named because, when climbed, it was "the most satisfactory view-point, we agreed, that we had reached in the Rockies". (Noyes)

Ochre; peaks, Oldman river, Alta.; after beds of red shale on the shoulder of this mountain.

Odaray; pass and mountain, Kicking Horse river, B.C.; Stoney Indian for 'very brushy' or 'wind-fall.' (Habel)

Oesa; lake, Kicking Horse river, B.C.; from a Stoney Indian word meaning 'ice'; so called because its surface is ice-covered practically all the time.

Ogden; mount, Yoho river, B.C.; after I. G. Ogden, Vice-President, Canadian Pacific Ry.

Ogre; mountain, Blaeberry river, B.C.; "from the fantastic resemblance of the summit to an ogre." (Wheeler)

O'Hara; lake, Kicking Horse river, B.C.; after Lieut.-Col. O'Hara, R.A., who frequently visited the lake.

Oke; mount, Kicking Horse river, B.C.; after Wm. J. Oke, who prospected in Ice River valley. (Allen)

Old Fort; creek, Bow river, Alta.; after ruins of Hudson's Bay Co.'s fort, near mouth.

Oldman; river, Alta.; Dawson says that, near the point at which the Livingstone* river issues from the mountains, "are three cairns; the first, a wide mound, about eight feet high, composed of stones and small boulders, and evidently very old, the two others smaller. As these are of no use as landmarks, they have probably been formed in the course of years by the addition of a stone, by each Indian entering the mountains by this route, 'for luck.' On a narrow piece of flat, open ground, a short distance further on, are the obscure remains of a couple of rectangles formed of larger stones. This place is well known to all the

*This portion of the Livingstone is now included in the Oldman.

Indians, and named by them the 'Old Man's playing ground.' It is from this spot that the Old Man river derives its name, many superstitions attaching to the neighbourhood. The 'Old Man,' *Wî-suk-î-tshak* of the Crees, is a mythical character, with supernatural attributes, familiar under one name or other, to all students of American folklore." The name of the river in Cree is *Is-e-enoo-met-ewe-win-si-pi*, in Stoney, *Is-sa-goo-win-ih-da-wap-ta*. On the map accompanying the Palliser Expedition report it is designated 'Old Man or Arrow river.'

Oliver; creek, Oldman river, Alta.; after the late W. Oliver, one of the early settlers.

Opabin; creek, Brazeau river, Alta., and pass, Kicking Horse river, B.C.; Stoney Indian word signifying 'rocky.'

Opal; mountains, Kananaskis river, Alta.; from small cavities found here, lined with quartz crystals, coated with films of opal.

Osborn; mount, Elk river, B.C.; after Prof. Henry Fairfield Osborn, New York. (Hornaday)

Ottertail; river, mountain, pass and railway station, Kicking Horse river, B.C.; translation of Indian name of the river.

Otto; pass and creek, Kicking Horse river, B.C.; probably after Bruce Otto, who, in 1910, travelled by Baker and Howse passes and North Saskatchewan river to the Freshfield group.

Owen; mount, Kicking Horse river, B.C.; named by J. J. McArthur in 1886, after a member of his survey party, Frank Owen.

Oyster; creek, Oldman river, Alta.; there are large beds of fossil oysters (*ostrea*) in its banks.

Oyster; peak, Bow river, Alta.; after "certain curious formations of limestone resembling oysters that were found in the shale around its base." Probably *ostrea* fossils.

***Ozada**; railway station, Bow river, Alta.; Stoney Indian word meaning 'the forks of the river'; it is near the junction of the Bow and Kananaskis.

P

Paget; mount, Kicking Horse river, B.C.; after Rev. Dean Paget, Calgary, who made the first recorded ascent.

Palliser; range, Bow river, Alta. and river, Kootenay river, B.C.; after Capt. John Palliser (1807-87); commanded an expedition, 1857-60, to explore the country between the 49th parallel and the North Saskatchewan and between the Red river and the Rockies. He was also instructed to ascertain whether there were practicable passes south of Athabaska pass.

Palliser; railway station, Kicking Horse river, B.C.

Panther; river and mountain, Red Deer river, Alta.; Dawson says: "Panther river is probably a sufficiently near approach to the Indian name of the stream which signifies 'The river where the mountain lion was killed.' This in Stoney, is rendered *It-mos-tunga'-moos-ta-ga-té-wap-ta*; in Cree, *Mis'-si'-pi'-sioo-ka'-nipa'-hiht-si'-pi'*."

Paradise; valley, Bow river, Alta.; Wilcox says: the sun "flooded the valley on the eastern side of the pass with light, bringing out so charmingly the contrasts in colour . . . that it was promptly named 'Wastach' (*q.v.*) or 'Paradise' valley."

Park; mountain, Kicking Horse river, B.C.; descriptive of park-like country in neighbourhood. (Wilson)

Parsons; railway station, Columbia river, B.C.; after a resident.

- Passburg**; railway station, Crowsnest river, Alta.; at entrance to Crowsnest pass.
- Paul**; mount, Athabaska river, Alta.; "after Paul Sharples, the first white child to go into Maligne; made all the climbs; nine years old." (Mrs. Schäffer)
- Peechee**; mount, Bow river, Alta.; after Sir George Simpson's (*q.v.*) half-breed guide.
- Pengelly**; mount, Elk river, B.C. and Alta.; named by Wheeler; his assistant, A. J. Campbell, D.L.S., married a Miss Pengelly whose ancestors came from Pengelly, Cornwall, Eng.
- Petroleum**; ridge, Oldman river, Alta.; near petroleum claims.
- Peyto**; lake and glacier, North Saskatchewan river, Alta.; named by Collie after his guide, Bill Peyto.
- Phillips**; mount, Elk river, B.C.; after John M. Phillips, Pennsylvania State Game Commissioner. (Hornaday)
- Pigeon**; mountain, Bow river, Alta.; probably after the wild pigeons seen in the vicinity. (Bourgeau)
- Pika**; peak, Pipestone river, Alta.; "a curious rock formation at the top is not unlike" the little chief hare or pika.
- Pilkington**; mount, Blaeberry river, B.C. and Alta.; after a member of the Alpine Club. (Stutfield and Collie)
- Pilot**; mountain, Bow river, Alta.; so named because it is visible for a long distance down the valley.
- Pincher**; mountain, creek and town, Oldman river, Alta.; name first applied to the creek by man who lost his pinchers (pincers) on its banks.
- Pinnacle**; mountain, Bow river, Alta.; descriptive. (Wilcox)
- Pinto**; lake, North Saskatchewan river, Alta.; after a pinto (piebald) horse lost when returning from mount Brown. (Coleman)
- Pipestone**; river, Bow river, Alta.; Dawson says: after "the occurrence on it of fragments of soft, fine-grained, grey-blue argillite, which the Indians have used in the manufacture of pipes. It is *Pa-hooh-to-hi'-agoo-pi'-wap-ta* in Stoney, *Moni'-spaw-gun-na-nis-si'-pi'* of the Crees, signifying "Blue pipe-stone river." (Hector)
- Pipestone**; pass, Pipestone river, Alta.
- Pisgah**; mount, Columbia river, B.C.; Biblical; from its summit, Collie obtained a splendid view of the land he was about to enter. (Collie)
- Plateau**; mountains, Oldman river, Alta.; descriptive.
- Poboktan**; range, pass and creek, Athabaska river, Alta.; from the owls seen by Coleman on the trees near the summit of the pass; *poboktan* is Stoney for "owl."
- Pollinger**; mount, Kicking Horse river, B.C.; after Joseph Pollinger, Swiss guide; made first ascents of The President, The Vice President and other peaks.
- Popes**; peak, Bow river, Alta. and B.C.; formerly called Boundary peak; name changed by order in council, April 4, 1887; after late Hon. John Henry Pope, Minister of Agriculture, 1871-73 and 1878-85; Minister of Railways and Canals, 1885-89.
- Porcupine**; creek, Kicking Horse river, B.C.; probably because frequented by porcupines.
- *Porcupine**; hills, Oldman river, Alta.; from resemblance in outline to a porcupine; the Blackfoot name, *ky-es-kagh-p-oghsuyiss*, means 'porcupine tail.'
- Portal**; peak, Bow lake, Alta.; descriptive. (Thompson)
- President**; peak, pass and range, Kicking Horse river, B.C.; after Lord Shaughnessy, President of the Canadian Pacific railway. (McNicoll)
- Prospect**; hill, Oldman river, Alta.; descriptive of view from summit.

- Prospector**; valley, Vermilion river, B.C.; after an old prospector's camp near its entrance. (Wilcox)
- Protection**; mountain, Bow river, Alta.; it "shuts off" an unusually beautiful valley from Baker Creek valley. (Porter)
- Prow**; mountain, Red Deer river, Alta.; resembles the prow of a ship.
- Ptarmigan**; lake and peak, Bow river, Alta.; from the large numbers of ptarmigan that frequent the locality.
- Ptolemy**; peak and pass, Crownsnest river, Alta., and B.C.; the peak resembles "a man sitting with arms folded." (Bridgland)
- Pulpit**; peak, Hector lake, Bow river, Alta.; descriptive. (Thompson)
- Pulsatilla**; mountain, Bow river, Alta.; *pulsatilla* is a sub-generic name for one section of the genus *Anemone*.
- Pyramid**; mountain, North Saskatchewan river, Alta.; resembles a pyramid.

Q

- Quincy**; mount, Athabaska river, Alta.; named by A. P. Coleman after his brother, Lucius Quincy Coleman; their mother (*née* Adams) was a relative of John Quincy Adams.

R

- Racehorse**; creek, Oldman river, Alta.; probably descriptive; has a very swift current.
- Rae**; mount, Elbow river, Alta.; after Dr. John Rae, Arctic explorer; in 1854, brought back news of loss of Franklin expedition. (Hector)
- { **Raven**; river, Red Deer river, Alta.; translation of Cree name *ka-ka-koo*.
- { ***Raven**; post office, Red Deer river, Alta.
- Redburn**; creek and peak, Blaeberry river, B.C.; first called 'Red Indian'; name changed to Redburn after reddish rocks in valley of the stream.
- { **Red Deer**; river, Alta.; Indian name is *was-ka-soo*, meaning 'many deer or elk,' which, formerly, were numerous in vicinity of the river.
- { ***Red Deer**; town and electoral dist., Alta.
- Redearth**; creek, Bow river, Alta.; from the red ochre found in places on its banks; formerly called 'Vermilion'; name changed to avoid duplication.
- { **Redoubt**; peak, Bow river, Alta.; "the formation resembles a huge redoubt." (Wheeler)
- { **Redoubt**; lake, Bow river, Alta.
- Richardson**; mount, Red Deer river, Alta.; after Sir John Richardson (1787-1866); he was Surgeon and Naturalist in the Arctic expeditions of Franklin, 1819-22 and 1825-27; commanded a Franklin search expedition, 1848-49. (Hector)
- Robinson**; mount, Bow river, Alta.; probably after Rev. T. R. Robinson, President of the Royal Society, 1849-50. (Palliser)
- Rock Tower**; mountain, Kicking Horse river, B.C.; descriptive.
- Rocky**; mountains, Alta., B.C., Yukon and N.W.T.; translation of Cree name "*as-sin-wati*"; viewed from the prairies they present a great wall of rock.
- *Ronde, Roché**; peak, Athabaska river, Alta.; descriptive.
- Ross**; lake, Kicking Horse river, B.C.; after late Sir James Ross; in 1884, he was Superintendent of Construction, Canadian Pacific Ry.
- Ruby**; ridge, Oldman river, Alta.; after the beds of bright red shale near its summit.
- Rundle**; mount, Bow river, Alta.; after Rev. Robt. Terrill Rundle, Methodist missionary to the Indians of the North West, 1840-48. The Minutes of Council, of the Hudson's Bay Co., 1843, provide that a "commissioned gentleman's allowance" be paid to him. (Hector)

S

Sabine; mount, Kootenay river, B.C.; after Maj.-Gen. Sir Edward Sabine (1788–1883), a noted British physicist and astronomer; President of the Royal Society, 1861–71. (Palliser)

Saddle; mountain, Bow river and peak, Ghost river, Alta.; from its shape, somewhat resembling a saddle.

Sage; creek, Kootenay river, B.C.; probably after the sage bush found in the arid districts of western United States and Canada.

Sage Creek; pass and mountain, Kootenay river, B.C. and Alta.

St. Nicholas; peak, Bow river, Alta.; “from a striking rock formation on the side of the peak that resembles Santa Claus.”

St. Piran; mount, Bow river, Alta.; after St. Piran, Liggan bay, Cornwall, Eng., the birthplace of W. J. Astley, late manager of Lake Louise chalet. (Wilcox)

Salter; creek, Highwood river, Alta., and mount, Elk river, B.C.; named by Dr. Dawson, 1884, after his half-breed packer.

Samson; peak, Maligne river, Athabaska river, Alta.; named by Mrs. Schäffer after a Stoney Indian, Samson Beaver, who drew a map that enabled her to find Maligne lake.

Sanitarium; post office, Bow river, Alta.; after Dr. Brett's sanitarium.

Sarbach; mount, North Saskatchewan river, Alta.; after Peter Sarbach, a Swiss guide; with Prof. Collie and G. P. Baker, made first ascent.

Saskatchewan; mount, North Saskatchewan river, Alta.; at the headwaters of the Saskatchewan, which from Cree, *kis-is-ska-tche-wan*, signifying ‘swift current.’

Sawback; range, Bow river, Alta.; from the vertical beds of grey limestone that form the serrated peaks of the range. (Hector)

Sawback; lake, creek and railway station, Bow river, Alta.

Scab; river, North Saskatchewan river, Alta.; translation of Indian name.

Schäffer; mount, Kicking Horse river, B.C.; after Dr. and Mrs. Schäffer, Philadelphia; they made explorations in the Canadian Rockies; Mrs. Schäffer (now Mrs. Warren) has devoted special attention to the wild flowers of the Rockies and is the authoress of *Old Indian Trails*. (Wilson)

Sealion; mountain, Blaeberry river, B.C.; “seen from the Amiskwi pass, the general shape of the mountain reminds one of an enormous sea-lion with its head reared aloft.” (Wheeler)

***Seebee**; railway station, Bow river, Alta.; Cree Indian for ‘river.’

Selkirk; mount, Kootenay river, B.C.; after Thomas (Douglas), 5th Earl of Selkirk (1771–1820); formed settlements in Prince Edward Island and Ontario, also famous Selkirk settlement in present Manitoba.

Sentinel; mountain, Livingstone river, and North Saskatchewan river, Alta.; from isolated position.

Sentinel; pass, Livingstone river, Alta.

Sentry; railway station, Crownsnest river, Alta.

Shadow; lake, Bow river, Alta.; descriptive.

Sharp; mount, Kicking Horse river, B.C.; named by J. H. Scattergood; suggested by its appearance when seen from mount Mollison.

Sharp; peak, Elk river, B.C.; descriptive.

Sheep; river, Highwood river, Alta.; so named because favourite haunt of the Rocky Mountain sheep or bighorn.

Sheep; river, Ram river, Alta.

Sheep; mountain, Oldman river, Alta.

Sheol; mountain, Bow river, Alta.; previously called "Devils Thumb"; name changed to avoid confusion with Devils Head and similar names.

Sherbrooke; lake, Kicking Horse river, B.C.; after Sherbrooke, city, Que.

***Sibbald**; creek, Bow river, Alta.; after Frank Sibbald, a rancher.

Siffleur; river and mountain, North Saskatchewan river, Alta.; after the siffleur, a whistling marmot.

Silverhorn; mount, North Saskatchewan river, Alta.; descriptive of its snow-covered summit. (Noyes)

Simpson; river, Vermilion river, B.C. and pass, Alta. and B.C.; after Sir George Simpson (1792-1860), for many years Governor-in-Chief of Ruperts Land and head of the Hudson's Bay Co. in Canada. (Hector)

{ Sinclair; pass, Columbia river, B.C.; after James Sinclair. Blakiston says that, in 1858, he saw, near the confluence of the Kananaskis and Bow the "remains of many wooden carts which had been abandoned by a party of emigrants, under the late James Sinclair, on their way to the Columbia, in 1854." (Dawson)

{ Sinclair; post office and creek, Columbia river, B.C.

{ Skoki; valley, Bow river, Alta.; Indian name signifying "marsh or swamp." (Porter)

{ Skoki; mountain, Bow river, Alta.

Slate; mountains, Bow river, Alta.; from the slaty rock composing them.

***Smet, Roche de**; mountain, Athabaska river, Alta.; after the famous missionary, Father Pierre-Jean de Smet (1801-73); for many years, laboured among the Indians of the western and northwestern states. In 1845, he crossed the Rockies by way of Cross river and White Man pass; wintered at Edmonton and recrossed the mountains by the Athabaska pass in 1846.

***Smith**; creek, Brazeau river, Alta.; after one of the men employed when staking coal claims in this vicinity.

***Snaring**; river, Athabaska river, Alta.; "after a tribe of Indians that, at one time, lived here, dwelling in holes dug in the ground, and subsisting on animals which they captured with snares of green hide." (Hector)

Snow; creek, Red Deer river and peak, North Saskatchewan river, Alta.; descriptive.

Sodalite; valley, Kicking Horse river, B.C.; after the mineral, sodalite, found there. (Whymper)

Sofa; peaks, Oldman river, Alta.; descriptive of outline.

{ Southesk; river, Brazeau river, Alta.; after James (Carnegie) 9th Earl of Southesk (1827-1905); in 1855, established claim to Earldom of Southesk, forfeited by 5th Earl for participation in rebellion of 1715; described travels in western Canada in *Saskatchewan and Rocky Mountains*.

{ Southesk Cairn; mountain, Brazeau river, Alta.

South Kootenay; pass, Alta. and B.C.; see Kootenay.

South Saskatchewan; river, Alta. and Sask.; from Cree Indian name "*kis-is-ska-tche-wan*" meaning swift current.

{ Sparwood; railway station, Elk river, B.C.; named by Canadian Pacific engineers; trees in vicinity were suitable for spars for vessels.

{ Sparwood; range, Elk river, B.C.

Spencer; range, Columbia river, B.C.; named by Collie after Sydney Spencer, Bath, Eng.; "an old climbing comrade of Stutfield's"; accompanied Stutfield and Collie on their Bush River trip, 1900.

Spike; mountain, Kicking Horse river, B.C.; "looking up Otterhead creek, this peak is seen as a huge spike rising in mid-air."

- Split**; creek, Blaeberry river, B.C.; descriptive; it divides into two branches of equal size.
- { **Spray**; river, Bow river, Alta.; from spray of falls in the river.
Spray; range, Bow river, Alta.
- Stanford**; range, Columbia river, B.C.; after Edward Stanford, noted English geographer. (Palliser)
- Steele**; village, Kootenay river, B.C.; after Inspector (now General) Sam Steele, late of Royal North West Mounted Police; in 1884, Inspector Steele was in command of the Mounted Police at Golden, B.C.
- Steep**; creek, Kicking Horse river, B.C.; descriptive.
- Stephen**; mount and railway station, Kicking Horse river, B.C.; after Sir George Stephen, Baron Mount Stephen; created a peer, 1891; formerly President of the Canadian Pacific Ry.
- Stephens**; range, glacier, and creek, Columbia river, B.C.; named by Stutfield and Collie after Fred Stephens, their head packer during their Bush River trip in 1900.
- Stewart**; cañon, Bow river, Alta.; after George A. Stewart, D.L.S., late Superintendent of Rocky Mountains park.
- Stewart**; mount, North Saskatchewan river, Alta.; after Louis B. Stewart, D.T.S., Professor of Surveying, Toronto. (Coleman)
- Storm**; creek, Highwood river, Alta.; there was a very heavy rainfall while Dawson was camped on the stream in 1884. (Dawson)
- Storm**; mountain, Bow river, Alta. and B.C.; after numerous storm clouds seen on its summit. (Dawson)
- Stutfield**; peak, Athabaska river, Alta.; after Hugh E. M. Stutfield, member of the English Alpine Club; joint author, with Collie, of *Climbs and Explorations in the Canadian Rockies*.
- Sullivan**; mount, North Saskatchewan river, Alta.; after John W. Sullivan, Secretary, Palliser expedition. (Hector)
- Sulphur**; creek, Bull river, B.C.; after sulphur spring, two miles from mouth.
- { **Sulphur**; mountain, Bow river, Alta.; there are sulphur hot springs at base.
Sulphur Spring; post office, Bow river, Alta.
- Summit**; lake, Kicking Horse river, B.C.; descriptive.
- Sundance**; creek and pass, Bow river, Alta.; creek so named because near "the scene of numerous sun dances."
- Sunwapta**; river, Athabaska river, Alta.; Stoney Indian signifying 'turbulent river.'
- { **Surprise**; rapids, Columbia river, B.C.; to the navigator descending the river, they are invisible till he is very close to the head.
Surprise; mount, Columbia river, B.C.
- Survey**; peak, North Saskatchewan river, Alta.; climbed by Collie to enable him to commence his plane-table survey.
- Syncline**; mount, Oldman river, Alta.; descriptive of synclinal fold in the rocks composing it.

T

- Table**; mountain, Oldman river, Alta.; descriptive.
- Takakkaw**; falls, Yoho valley, B.C.; Indian name signifying 'it is wonderful'; suggested by Sir Wm. Van Horne.
- Tallon**; creek, Kicking Horse river, B.C.; named by T. E. Wilson after L. Tallon, P.L.S., assistant to W. S. Drewry in survey of Rockies in 1888 and 1892.

Tanglefoot; creek, Bull river, B.C.; descriptive; much devil's club and heavy underbrush on its banks.

Tekarra; mount, Athabaska river, Alta.; named by Hector after Tekarra, an Iroquois hunter who accompanied him during his trip up the Athabaska river in 1859.

Temple; mount, Bow river, Alta.; named by Dawson after Sir Richard Temple, President, Economic Science and Statistics section, British Association, 1884; elected leader of B.A. excursion party to the Rockies in that year.

Temple; railway station, Bow river, Alta.

Ten Peaks; mountains, Bow river, Alta. and B.C.; surround the valley formerly called Desolation valley; the summits were numbered from east to west.

Ten Peaks; valley, Bow river, Alta.

Tent; mountain, Crowsnest river, Alta. and B.C.; descriptive.

Tent; pass, Crowsnest river, Alta. and B.C.

Terrace; mountain, Bow river, Alta.; from the appearance of the strata. (Hector)

The Mitre; mountain, Bow river, Alta.; from its resemblance to a bishop's mitre.

The Monarch; mountain, Kootenay river, B.C.; descriptive.

The Steeples; mountain, Bull river, B.C.; "from its peculiar form." Name now obsolete. (Blakiston)

Thompson; pass, North Saskatchewan river, Alta. and B.C., and mount, Bow river, Alta.; after C. S. Thompson, "one of the most enthusiastic of the pioneers of mountaineering amongst the ranges of both the Selkirk and the Rockies." (Collie)

Three Sisters; mountains, Bow river, Alta.; three peaks in same ridge; resemble each other.

Tilted; mountain, Bow river, Alta.; descriptive of rocks composing it.

Tobacco; plains, Kootenay river, B.C.; the Kootenays formerly obtained tobacco from the Hudson's Bay Co. at Kootenay post.

Todhunter; creek, Fording river, B.C.; after John Todhunter, employee of Canadian Pacific Ry.

Tokumm; creek, Vermilion river, B.C.; Stoney Indian for "red fox."

Tombstone; mountain, Elbow river, Alta.; from its resemblance in outline to a tombstone.

Tower of Babel; peak, Bow river, Alta.; from a fancied resemblance to a large tower. (Wilcox)

Tracy; creek, Kootenay river, B.C.; after Frank Tracy, who discovered the Estella mine at the head of the creek.

Trolltinder; peak, Kicking Horse river, B.C.; named by Habel as it resembles "somewhat a well known mountain in the Norwegian valley of Romsdalen"; the name signifies "witch's peak."

Turquoise; lake, Bow river, Alta.; descriptive of colour. (Baker)

Turret; mountain, Oldman river, Alta.; from its castellated appearance; Cree name "*O-mask-we-oo as-sin-wā-ti*" meaning 'Queen mountain.' Named Castle mountain by Blakiston; name changed to avoid confusion with Castle mountain on Bow river.

Turtle; mountain, Oldman river, Alta.; translation of Indian name; resembled a turtle till the Frank rock-slide in 1903, which "rather spoiled the likeness."

Tuzo; mount, Bow river, Alta.; after Miss Henrietta L. Tuzo of Warlingham, England, the first lady to ascend Eagle peak.

Twin; lakes, Blaeberry river, and falls, Yoho river, B.C. and lakes, Bow river, Alta.; resemble each other.

Twinn; peaks, Athabaska river, Alta.; descriptive. (Stutfield and Collie)

Tyrrell; mount, Red Deer river, Alta.; after J. B. Tyrrell, M.E., late of Geological Survey; assistant to Dawson in survey of Rocky mountains in 1883. (Dawson)

U

Unwin; mount, Maligne lake, Athabaska river, Alta.; after "my second guide, Sidney Unwin." (Mrs. Schäffer)

V

Vaches; prairie, Athabaska river, Alta.; after the buffalo, which formerly ranged in the mountains to this point.

Van Horne; range, Kicking Horse river, B.C.; after late Sir William Van Horne, Chairman of the Canadian Pacific Ry. (Dawson)

Vaux; mount, Kicking Horse river, B.C.; possibly after George Charles (Mostyn) 6th Lord Vaux de Harrowden (1804-83). (Hector)

Vérendrye; mount, Vermilion river, B.C.; after Pierre Gaultier de Varennes, Sieur de la Vérendrye; he and his sons explored the upper Missouri and discovered lake Manitoba, lake Winnipegosis and the Saskatchewan river.

Vermilion; river, Kootenay river, B.C.; from the ochre of ferruginous beds at Vermilion plain on this stream.

Vermilion; peak and range, Kootenay river, B.C.

Vermilion; pass, Alta. and B.C.

Vermilion; lakes, Bow river, Alta.; from ferruginous beds in vicinity.

Vertebrae; mountain, Bush river, B.C.; from its resemblance to a portion of a vertebral column.

Vertical; mountain, Kootenay river, B.C.; descriptive of its very steep slope.

Vice-President; mount, Kicking Horse river, B.C.; after late D. McNicoll, 1st Vice-President, Canadian Pacific Ry.

Victoria; mount and glacier, Bow river, Alta.; named by McArthur, after late Queen Victoria (1819-1901).

Victoria; peak, Oldman river, Alta.

W

Waitabit; creek, Columbia river, B.C.; near its mouth, travellers descending the river rest and adjust the loads in their canoes before entering the rapids.

Waldo; railway station, Kootenay river, B.C.; prior to 1902, was known as Crows-nest landing and was Customs port; when the port was moved to Phillips, an old man, Wm. Waldorf Waldo, occupied the deserted buildings.

Walker; mount, Blaeberry river, B.C. and Alta.; after a member of the Alpine Club. (Stutfield and Collie)

Wall; lake, Kootenay river, B.C.; descriptive of 'wall' of rock near shore.

Wallenger; creek, Wild Horse creek, Kootenay river, B.C.; after N. S. A. Wallenger, Government agent, Cranbrook.

***Wapiabi;** creek, Brazeau river, Alta.; Stoney Indian name signifying 'grave'; after a grave on its banks.

Wapta; station, peak, lake, falls and glacier, Kicking Horse river, B.C.; the Stoney Indian word for "river."

Waputik; range and snowfield, Bow river, Alta. and B.C.; Stoney Indian name meaning 'white goat'; when named by Dawson in 1884, it was a favourite haunt of Rocky Mountain goat.

Wardrop; railway station, Elk river, B.C.; after a lumberman, who operated the first sawmill.

- Warren**; mount, Maligne river, Athabaska river, Alta.; named by Mrs. Schäffer after her head guide.
- Wasa**; railway station and creek, Kootenay river, B.C.; after Vasa, a län of Finland.
- Washmawapta**; glacier, Kootenay river, B.C.; Stoney Indian word signifying 'Ice river.'
- Wastach**; pass and river, Bow river, Alta.; a descriptive name; Stoney Indian for 'beautiful.'
- Watchman**; peak, Columbia river, B.C.; it "towers like a sentinel 4,000 feet above the vivid blue-green waters." (Outram)
- Waterfall**; valley, Amiskwi river, B.C.; after Twin falls (*q.v.*).
- Waterfowl**; lakes, Mistaya river, Alta.; many ducks seen on it.
- Waterton**; lakes, river and mount, Oldman river, Alta.; after Charles Waterton, naturalist (1782-1865) author of *Wanderings in South America, the North West of the United States and the Antilles in 1812, '16, '20 and '24.* (Blakiston)
- Weed**; mount, Siffleur river, Alta.; after G. M. Weed, Appalachian Mountain Club; made a number of 'first ascents' in the Canadian Rockies.
- Weigert**; creek, Elk river, B.C.; after Chas. Weinert, who located a ranch there in 1896.
- Wenkchemna**; mountain and glacier, Bow river, Alta., and pass, Alta. and B.C.; Stoney Indian numeral meaning 'ten'; tenth of the Ten Peaks (*q.v.*)
- Whaleback**; mountain, Kicking Horse river, B.C.; from its shape.
- Whirlpool**; river, Athabaska river, Alta.; after the numerous eddies in this stream.
- Whistler**; mountain, Oldman river, Alta.; probably after the siffleur or whistling marmot.
- White**; mount, Red Deer river, Alta.; named by Dr. G. M. Dawson after James White, Commission of Conservation; assistant to Dr. Dawson in surveys of southern Rocky mountains in 1884.
- White Man**; pass, Spray river, Alta. and B.C.; translation of the Indian name; probably refers to Father de Smet's (*q.v.*) journey.
- Whiterabbit**; creek, North Saskatchewan river, Alta.; translation of Stoney Indian name.
- Whymper**; mount, Vermilion river, B.C.; after late Edward Whymper, the famous mountain climber.
- Whyte**; mount, Bow river, Alta.; after late Sir William Whyte, 2nd Vice-President of Canadian Pacific Ry.
- Wigwam**; river, Elk river, B.C.; after a large Indian camping ground on the river. (Palliser)
- Wilcox**; mount and pass, Saskatchewan river, Alta.; after Walter Dwight Wilcox, who probably was the first white man to traverse the pass. (Collie)
- Wild Horse**; creek, Kootenay river, B.C.; from the abundance of horses in the district.
- *Willow**; creek, Oldman river, Alta.; after willow trees on its banks.
- { Willowbank**; creek, Blaeberry river, B.C.; after the willow trees on its banks.
- { Willowbank**; mountain, Blaeberry river, B.C.
- Wilmer**; town, Columbia river, B.C.; after the Hon. Wilmer C. Wells, sometime, member of the Government of British Columbia.
- Wilson**; range, Waterton river, Alta.; after Lieut. C. W. Wilson, R.E., Secretary to British Boundary Commission, Pacific to the Rockies, 1858-62; name applied to a peak only by Blakiston.

- Wilson**; peak and glacier, North Saskatchewan river, Alta.; after Tom Wilson, well known guide of Banff. (Collie)
- Wind**; mountain, Bow river, Alta.; "a high peak.....on which the clouds were gathering and curling about". (Bourgeau)
- Windermere**; village, Columbia river, B.C.; the mountains and valleys resemble Windermere, Eng., which is noted for its beautiful scenery.
- Wisukitshak**; range, Elk river, B.C.; after the mythical 'Old Man' (*q.v.*) of the Cree Indians.
- Wiwaxy**; peaks, Cataract brook, Kicking Horse river, B.C.; Stoney Indian word, signifies 'windy.'
- *Wood**; river, Athabaska river, B.C.; probably after the dense forest on the lower portion of this stream.
- Woolley**; peak, Athabaska river, Alta.; after Herman Woolley, of Caucasian and Alpine mountaineering fame. (Collie)

Y

- Yarrell**; mount, Flathead river, B.C.; after William Yarrell (1784-1856), a distinguished English zoologist. (Blakiston)
- { **Yarrow**; creek, Oldman river, Alta.; probably after Yarrow river, Lancashire, Eng. or Yarrow parish, Selkirkshire, Scot.
- { **Yarrow**; peak, Oldman river, Alta.
- { ***Yellowhead**; pass, Athabaska river, Alta. and B.C.; Cheadle says: "from being the spot chosen by an Iroquois trapper, known by the *sobriquet* of the Tête Jaune, or 'Yellow Head,' to hide the furs he obtained on the western side." He also says the original 'cache' was at the confluence of the Fraser and the Grand fork. Sometimes called the Leather pass, because the Hudson's Bay Co.'s posts in northern British Columbia obtained supplies of leather (dressed moose or caribou skins) by way of this pass. Also called the Caledonian (*q.v.*) valley.
- { ***Yellowhead**; mount, railway station, and lake, Fraser river, B.C.
- Yoho**; national park, mount, pass, river, lake and glacier, Kicking Horse river, B.C.; Cree Indian word, signifying 'astonishment.'
- York**; creek, Crowsnest river, Alta.; said to be named after York, cathedral city, Eng.
- Yukness**; mount, Bow river, B.C.; Sioux Indian for 'sharpened, as with a knife.'

Z

- Zinc**; mountain and valley, Kicking Horse river, B.C.; after zinc mine on slope of Zinc mountain. (Whymper)

*ADDENDA**

- Bauerman**; mount, Waterton river, Alta.; after H. Bauerman, Geologist, British Commission, Inter. Boundary Com., Pacific to the Rocky mountains, 1858-62.
- Boswell**; mount, Waterton river, Alta.; after Mr. Boswell, Veterinary Surgeon, British Boundary Commission, lake of the Woods to the Rockies, 1872-74.
- Darrah**; mount, Livingstone river, Alta. and B.C.; after Capt. Chas. John Darrah, R.E., Astronomer, British Boundary Commission, Pacific to the Rockies, 1858-62.
- Dungarvan**; mount, Waterton river, Alta. and B. C.; after Dungarvan, seaport and harbour, Waterford co., Ireland; Duke of Devonshire is lord of the manor. (Bridgland)
- Errigal**; mount, Waterton river, Alta. and B. C.; after Errigal mountain, Donegal, Ireland, the highest point in Ulster. (Bridgland)
- Erris**; mount, Livingstone river, Alta. and B. C.; after Erris, a prominent headland in Mayo co., Ireland. (Bridgland)
- Galwey**; mount, Waterton river, Alta., after Lieut. Galwey, R.E., Assistant Astronomer, British Boundary Commission, lake of the Woods to the Rockies, 1872-74.
- Glendowan**; mount, Waterton river, Alta.; after Glendowan range, Donegal co., Ireland.
- Haig**; mount, Oldman river, Alta. and B. C.; after Capt. R. W. Haig, R. A., Astronomer, British Boundary Commission, Pacific to the Rockies, 1858-62.
- Hawkins**; mount, Waterton river, Alta.; after Lt.-Col. J. S. Hawkins, British Commissioner for the Boundary, Pacific to the Rockies, 1858-62.
- Lyall**; mount, Oldman river, Alta. and B. C.; after Dr. David Lyall, M.D., Surgeon and Naturalist, British Boundary Commission, Pacific to the Rockies, 1858-62.
- Monarch**; mountain, Simpson river, B. C.; from its commanding position or appearance.
- Phillipps**; mount, Livingstone river, Alta.; after late Michael Phillipps, Elko, B.C.; came to British Columbia in 1863; clerk in Hudson's Bay Co. post, fort Shepherd, 1864; in charge of H. B. Co. post at mouth of Wild Horse creek, 1865.
- Richards**; mount, Waterton river, Alta.; after Capt. G. H. Richards, R. N., Second Commissioner, British Boundary Commission, Pacific to the Rockies, 1858-62.
- Roche**; mount, Waterton river, Alta.; after Lieut. Richard Roche, R.N., British Boundary Commission, Pacific to the Rockies, 1858-62.
- Rowe**; mount, Waterton river, Alta. and B.C.; after Lieut. Rowe, R.E., Surveying Officer, British Boundary Commission, lake of the Woods to the Rockies, 1872-74.
- Spionko**; mount, Waterton river, Alta.; an abbreviation of Spion Kop, a battle in the Boer war.
- Ward**; mount, Livingstone river, Alta.; after Capt. Ward, R.E., Secretary, British Boundary Commission, lake of the Woods to the Rockies, 1872-74.

*These names were approved by the Geographic Board after the foregoing was in type.

Transactions of The Royal Society of Canada

SECTION III

SERIES III

JUNE 1916

VOL. X

PRESIDENTIAL ADDRESS

Agricultural Education and Research in Canada

BY FRANK T. SHUTT, M.A., D.Sc.

Dominion Chemist

(Delivered May 17th, 1916.)

For the purpose of this address our subject may be discussed under three headings: The Status of Agriculture in Canada, The Value of Science in Agriculture, and the Improvement of the Practice of Agriculture in Canada through Education, Demonstration and Research.

The Status of Agriculture in Canada

In order that we may properly appreciate the importance of research in agriculture in this country it is first necessary that we should understand the position of agriculture among the industries of the Dominion.

It is not too much to say that agriculture is Canada's basic and most valuable industry, the industry above all others for which the country as a whole is best adapted, the industry employing the most men and that creates more wealth annually than all our other industries put together. It has been the pioneer occupation of our people and it will remain, I believe, the staple business of our people. Upon its economic development and progress depends in a very large measure the welfare and prosperity of our national life.

To those whose lives and work are cast among the varied and important activities of one of our larger centres, these statements regarding the status and importance of agriculture may appear somewhat strange and perhaps overdrawn, but I am confident that they will, in the main, be confirmed by those who have studied the life and work of the Dominion as a whole and its natural resources, and more especially by those who know Canada by actual travel. It is

not my purpose to burden this address with statistics, but to place before you some facts in confirmation of my contention, I have asked Mr. Ernest H. Godfrey of the Dominion Census and Statistics Office for certain data bearing on my subject. He has very kindly responded and I shall now read the paragraphs that he has prepared.

"Number of Persons dependent upon Agriculture. The total population of Canada, as returned at the Census of 1911, was 7,206,643. Of this total 3,925,679, or about fifty-four per cent, was classified as rural. The number of persons engaged in or dependent upon agriculture in Canada may safely be placed at about fifty-five per cent of the total.

"Land in Canada capable of devotion to Agriculture. Varying estimates have been made from time to time as to the extent of land in Canada that can be devoted to agriculture out of the total land area of Canada, which is placed at 2,306,502,400 acres. Without including the areas outside of the nine provinces as at present constituted, a moderate estimate, based upon census data, is that 440,951,000 acres is possible of cultivation as farm land. (See Year Book, 1914, p. 208). The total area of land now within the boundaries of the nine provinces is 1,401,316,413 acres. Of this area 109,948,988 acres, or less than eight per cent, were returned at the Census of 1911 as in occupation as farm land.

"If, however, we confine attention to land within the provinces that is more immediately available for settlement, we find that altogether there are just under sixty million acres, consisting of about twenty-eight million acres of the Dominion Public Lands open to homestead entry, and about 31,800,000 acres of the Provincial Public Lands available for agricultural settlement.

"The occupied farm lands referred to, viz., 109,948,988 acres are divisible into improved lands, 48,733,823 acres and unimproved land 61,215,165 acres; so that adding this latter total to the 59,800,000 acres of public lands awaiting settlement, we get a total of about 120,000,000 acres of land capable of almost immediate application to agriculture.

"Value of Agricultural Production. In 1915 the field crops of Canada were valued at about \$800,000,000, but this was an exceptional year as regards yield, and the average annual value is more nearly \$650,000,000. If we add to this figure the estimated value of farm live stock, say \$750,000,000, we get a total of \$1,400,000,000 as the total value of the annual agricultural production of Canada. This figure does not include dairying products. In 1910 the total value of the butter and cheese production of Canada was returned as about \$69,500,000. The value of agricultural production,

relatively to other products of Canada, may be gathered from the following statements of the average total values of products in thousands of dollars.

Products	Value	Per cent of total
	Thousand dollars	p.c.
Agriculture.....	1,400,000 ¹	47
Dairying.....	70,000	2
Forestry, (including skins and furs of wild animals).....	177,000	6
Fisheries.....	33,000	1
Mines.....	130,000	4
Manufactures.....	1,200,000	40
Total.....	3,010,000	100

"This statement shows that the value of agricultural and dairying products taken together, amounts to about fifty per cent of the total, whilst it must be remembered that with regard to manufactures, which account for forty per cent of the total, there are included substantial values for numerous items of raw materials which also come under the heading of agricultural products."

These statistics, I think you will agree with me, amply testify that my statements with regard to the position that agriculture holds in the Dominion are not exaggerations, but the plain and sober truth.

If then we are agreed on this point, it will be obvious that all reasonable effort should be made to encourage and assist this national industry, by the education in agricultural matters of those upon the land and of those who will be the future farmers of our country, by practical demonstrations of methods of proven worth and by investigation to advance our knowledge in the science of agriculture and establish principles of fundamental importance and wide application. It is a matter of national congratulation that our governments, Federal and Provincial, have recognized their responsibilities and opportunities in this connection and have given in recent years gener-

¹ This includes the total value of farm livestock in Canada on December 31st, 1915, and therefore this figure involves a certain error, since it has been obtained by adding together field crop production and livestock capital. The annual increase in livestock value is not obtainable and this fact adds largely to the difficulty always experienced in estimating the total net annual production of Canadian agriculture.

ously for the establishment and carrying on of the several agencies which work for the improvement of agriculture. In this our governments may be said to have vied with one another with a result that Canada, considering her revenue, is probably to-day outdone by no country in the world in the maintenance of institutions and agencies, for the education of the farmer. Later in this address we shall attempt an enumeration of these agencies, but it may be noted here that the number of our Agricultural Colleges has increased very considerably in recent years and that Provincial Institutions of first importance are constantly increasing in their efficiency and adding to their teaching staffs and equipment. They are undoubtedly doing a most valuable educational work and are steadily widening and emphasizing their influence upon the practical farming of the Dominion.

Though agriculture is not a science in the same sense that chemistry, biology and physics are sciences, there is in a very real and vital sense a science of agriculture in which the basic sciences I have named and others are called upon to contribute towards the solution of problems affecting farming and to establish the truths which must furnish the foundation necessary for the rational conduct and development of the art. To elaborate this thought somewhat: It is evident, in the first place, that agriculture is a vocation or occupation whereby men earn a livelihood and in which they till the soil, sow and harvest crops, feed and raise livestock. It is an art or craft, therefore, requiring skill and experience in manipulation for its successful prosecution. It is obvious that above all the farmer is "a director of agencies (for he himself creates nothing), agencies which involve the life of the soil, the life of plants, the life of animals. He ought to know how these agencies may best be directed and controlled. From this view, and I believe it is the correct one, the science of agriculture, as supplying the basis for all this work, is very largely a sub-division of our latest development in pure chemistry, bio-chemistry; I say largely, for it is not exclusively bio-chemistry; physics, meteorology, economics and other sciences must be called upon in the attempt to establish the truth and to mark the way for further progress in the art of farming.

Considering the ages that it has been practised, the art of agriculture has unaided by science made but very slow progress. Ignorance of the nature of the factors involved, nay more, that there were any factors beyond those that were absolutely obvious and self evident, superstition, faulty observation leading to erroneous deductions, the lack of mental alertness and clear thinking in tracing out cause and effect—which in the past have so peculiarly characterized those engaged on the land—the habit of mind and life that may be

considered as a kind of conservatism to the methods of the past and almost an antagonism to change and which has largely arisen in a most natural way from the fact that the art or practice of farming has been handed down from father to son; to these and, perhaps, other causes may be attributed the fact that agriculture unaided by science made but little progress for centuries.

With the application of science to agriculture another day dawned. So recent is this day that the pioneers—first chemists, next biologists, finally physicists—have but passed from their labours in our own times. This brings home to us how very new is this field of research; compared with the application of science to metallurgy, for instance, it is a matter of yesterday. Nevertheless, the teachings of this new science have already exerted a beneficial influence. Throughout the civilized world the response has been rapid and prompt and the practice of farming has so improved in many of its phases—indeed we may say almost revolutionized—that it is scarcely recognizable as that of our fathers. This is most encouraging, not only to those engaged on the problems of agriculture, but to the state at large, for it means greater economy in work, a better conservation of our resources and the placing of agriculture upon a more intelligent and profitable basis. It means, above all, the raising of the whole status of farming, so that in the near future it will stand side by side with professions and callings that have hitherto been considered its superior. It is due to the teachings of science that our soils are more productive, that our yields are heavier, that our crops are more prolific and more nutritive, that our cows give more and richer milk, that our hens lay more eggs than half a century ago. The point I wish to emphasize is that the marked improvement in farming as an industry in recent years is due very largely to the abandonment of haphazard, rule-of-thumb methods and the adoption of methods based on the results of carefully, skillfully conducted investigation by chemists, botanists, physiologists, physicists, entomologists and other scientists. Rational, profitable farming to-day has scientific truths for its foundation.

It is not my purpose in this address to attempt any chronological account of the history of what may be termed agricultural science. Interesting and fascinating as this history is, the story is too long. Nor shall I burden this address with any detailed account of Canada's contribution to this science. Three years ago, in an address before the Royal Canadian Institute of Toronto, I outlined the various investigations that had been undertaken by the Dominion Experimental Farm system—Canada's chief agricultural research institution—during the twenty-five years of its existence, and endeavoured by a number of examples to show the practical results that might legitimately be

considered as the outcome and natural sequence of this Canadian work. Copies of this paper and the larger number of the reports and bulletins of the Experimental Farms, which give fuller details of the work, are still available for those interested in the subject.

Value of Science in Agriculture

It may serve to emphasize our contention that practical agriculture is influenced for good by scientific research and, further, bring home to us the benefit that is accruing therefrom if we recite one or two concrete examples of the applications of scientific discovery to the practice of farming.

One of the most interesting and basic in its influence is the appropriation of nitrogen by the leguminosae. The ancients were aware that clover in some way enriched the soil, for we find it recorded in Roman literature that a crop, say of a cereal, produced a larger yield when following clover than when following a nonleguminous crop, say of grain. This fact practically lay dormant for ages: it received no application in general farming; its significance for centuries was not realized. Probably one reason for this neglect or oversight was the difficulty frequently met with on certain classes of soils in getting a "catch" of clover, and we may here remark that following the discovery of why the legumes were soil-enrichers came the knowledge of those conditions favourable for their growth.

Chemistry was the first of the sciences to be applied to explain farming operations and to furnish the explanation of how plants and animals assimilate their food and to make clear the original sources of this food. During the nineteenth century, say from the time of Liebig, who may justly be styled the father of agricultural chemistry, chemists in England, in Germany and in France were very busy in analysing soils, crops and animals and thus as analytical methods were evolved and multiplied there accumulated a vast number of data from which theories were evolved to explain the part taken by the soil, by water and the atmosphere in plant nutrition. The larger number of the earlier theories have passed away, having been shown by subsequent work that their premises were faulty, or from the fact that the data from which they were drawn were inaccurate. With the improvement of analytical methods the data became more and more accurate.

The analyses of plants revealed the chemical elements of which they were composed; of these elements nitrogen was one. Analysis further showed, in connection with the problem we are discussing, that not only were the legumes richer in nitrogen, weight for weight

of dry matter, than plants of other orders, but the further and astounding fact that they left the soil richer in nitrogen by their growth. Where did this additional nitrogen come from? What was its source? If from the uncombined, free nitrogen of the air, in what way did the legumes appropriate it? For by this time it had been fairly well established that crops in general could only obtain the nitrogen necessary for their growth from the organized nitrogen in the soil.

Many chemists worked on this problem, prominent among whom was Gilbert of Rothamsted, England, who, with Lawes, for more than fifty years did such magnificent work in agricultural research both in the laboratory and field, and placed the whole world for all time under a debt of gratitude; for their work above that of all others has furnished the foundation of agricultural science upon which others of all nations have built and still are building. Unfortunately, Gilbert just missed the solution of the problem, chiefly through imperfect apparatus. It was a great disappointment to him. The discovery was made by Hellriegel and Wilfarth, who conclusively showed that the legumes obtained their nitrogen, or in part at least, from the nitrogen of the atmosphere, not of themselves, but through the agency of certain nitrogen-fixing bacteria in the soil, which attach themselves and reside in nodules or tubercles upon the roots of the legumes, passing on their elaborated nitrogen to their host—it appears to be a case of symbiosis—for the building up of its tissues of root, stem and leaf. Without the aid of these bacteria the legumes, like all other plants, must draw upon the nitrates of the soil for their supply of this important element. As I was in England and Germany at this time (1888), I had an excellent opportunity of learning at first hand the various steps of this discovery, which, for its far reaching effects and the practical results that have followed, must be regarded *the* agricultural discovery of the century. It is interesting to note that Gilbert subsequently repeated Hellriegel's and Wilfarth's work and confirmed their conclusions.

The next and most logical step was the preparation of cultures of these useful bacteria by the bacteriologists, and these cultures are today in extensive use for inoculating the seed and soil for the growing of legumes in districts found to be lacking in the nitrogen-fixing organisms.

A further step was the discovery by the chemists that clover and alfalfa and many other valuable legumes would not thrive in acid-reacting soil, that there was no development of the nodules in such soils. Thus was brought in the now common practice of testing the soil upon which it is wished to grow a legume and the application of lime or ground limestone to correct acidity if such be found.

I must refrain from further details of this interesting story, but I would impress upon you the important results that have accrued therefrom to our farmers. Our Canadian work has shown that from 75 to 150 pounds of nitrogen may be stored up in a season, per acre, by the more commonly used legumes, and that, if the crop is nodule-bearing, a very large part of this is from the atmosphere. This nitrogen, if the legume is ploughed under, or that part of it in the root system if the crop is removed, becomes available through nitrification for future crops of grain, etc. Out of all this has come the adoption of a rotation in which a legume forms a part and the practice of sowing clover with the cereal crop of the rotation, a plan now common, more especially in the older parts of the Dominion, one that is proving most economic and most valuable for the up-keep of the fertility of our soils. Our average acreage yields have been steadily improving in recent years, more especially in the cereals, and I attribute this fact in a large measure to the increased growing of clover and alfalfa throughout the Dominion, a natural result from our teachings and advice on this subject.

Closely related to the above are the recent studies of the microscopic life of the soil and the relation of this life to soil fertility. This is perhaps the latest phase of agricultural research, but already most valuable results to practical farming have been obtained. Soil bacteriologists, aided by chemistry, have established that the preparation of available food—and particularly of nitrogen—from the inert, insoluble stores of the soil is the life function of bacteria. Other things being equal, we may perhaps say that the number of these useful micro-organisms per unit of soil is a measure of the soil's productiveness. It is obvious that the working out of the chemical and mechanical treatments of the soil, which will encourage the development of these organisms, is an important and valuable research.

Further, it has been lately shown from a number of carefully conducted and most thorough investigations on the life of the soil, carried out at Rothamsted, that in addition to the nitrogen-fixing and other useful bacteria there are always present other forms of life, certain protozoa, that prey on these bacteria, checking their development and hence affecting soil fertility. The valuable part of this discovery, from the practical standpoint, has been the establishment of the fact that these predatory protozoa can be kept in check by processes of "partial sterilization" of the soil, as by moderately high temperatures or the use of live steam, toluene, formaldehyde or other chemicals and thus, without any addition of plant food, fertility of the soil increased. This is an eminently practical discovery. Though as yet methods of partial sterilization are not in use on the farms,

market gardeners and green-house workers have found them very valuable. There is a great future for research work in connection with the biology of the soil.

Following the determination of the chemical constituents of plants and the establishment of the sources from which they are drawn, came the use of chemical plant foods, the so-called commercial fertilizers. Laboratory and field work showed that of the thirteen or so chemical elements entering into the composition of vegetable structures, three only—nitrogen, phosphoric acid and potash—need be considered in practical agriculture. Of the others, save occasionally lime, the soil and the air might always be depended upon to furnish an ample supply for crop needs. Out of this knowledge, the result of scientific research, has grown the use of fertilizers to increase crop production. The first of these was superphosphate, advocated and manufactured by Lawes in the earlier years of his investigations at Rothamsted. We, in Canada, have as yet done little towards ascertaining the place that fertilizers can take in economic methods of soil management, but yearly we are adding to our store of knowledge in this direction. Though we believe and teach that adherence to a rational system for the upkeep of fertility, the keeping of livestock, a proper rotation and correct methods of soil cultivation will make the farmer largely independent of these artificial and expensive forms of plant food, we also believe that with increased land values and increasing prices of labour on the one hand, and of agricultural products on the other, intensive rather than extensive farming will be practised, and with this change will come the wider and better use of fertilizers. That this use may be made with a fair expectancy of a profitable return we are now experimenting widely on various types of soils and with many classes of crops.

So far we have spoken of research work in connection with the requirements of crops; we might similarly indicate the nature of investigations to determine the requirements in the animal economy; the digestibility of the nutrients in cattle feeds are for the most part well established and this knowledge with that of the requirements of the animal for its maintenance, growth and reproduction have enabled the agricultural chemist to formulate "balanced rations"—the proportions most economic of protein, fat and carbohydrates—for maintenance, for animals expending energy in doing work, for flesh production, for milk production, etc. Although the farmer can not understand the methods by which all this knowledge has been obtained, he has learnt the significance of the terms protein, fat and carbohydrates, that feeding stuffs differ in their composition, in their digestibility and hence in their nutritive value, and all this information he can

use in compounding his rations according to his available feeds and the requirements of his several animals. The intelligent stock feeder and dairyman no longer feeds in a haphazard manner whatever there happens to be at hand, but, using the tables of data giving the composition and digestibility of fodders and feeding stuffs, he is able to supplement in correct amounts his home grown fodders with various so-called "concentrates" rich in protein and fat, thus balancing the ration. In this way he may obtain results in flesh and milk production far exceeding in point of economy and profit anything that might be possible from haphazard feeding. Modern, up-to-date farming then is directly benefiting in this important branch of the industry from scientific investigation of the most profound character, investigations calling for and necessitating the deepest, broadest knowledge of chemistry, physiology and allied sciences as well as the employment of elaborate apparatus.

In the control of injurious insects and fungous diseases which attack crops the entomologist and the mycologist have in recent years, by studying life histories and devising methods for the extermination of these pests, done a great service for agriculture. The orchardist and fruit grower of the day avails himself of these discoveries, indeed, we may say that not only are hundreds of thousands of dollars saved yearly by the employment of insecticides and fungicides, but that in many parts of the Dominion, without these means of control, profitable fruit growing would be impossible. In all this investigatory work the chemist, as may be readily understood, has his part; indeed, there are few lines of research in which chemistry does not play an important part, directly and indirectly.

These are but a few instances, briefly outlined, of the application of science to agricultural problems, given to illustrate the practical advantages that accrue from scientific investigational work. It would be impossible in this address even to epitomize the many phases of this work or to enumerate the benefits that have arisen therefrom, but they may serve to impress upon you that the progress agriculture has made in recent times is directly the outcome and product of research.

The Improvement of the Practice of Agriculture in Canada through Education, Demonstration and Research

A review of the field of work carried on by Governments for the improvement of agriculture show that such work may be readily arranged or classed under one or other of the three following headings: educational, demonstrational and investigational. These are three distinct phases and yet in certain of their features are closely related and interdependent.

Educational work in agriculture should begin in the schools of the country and especially should it have attention in rural schools. The extent to which agricultural studies should occupy the time of teacher and pupil and the best method of presenting and inculcating the principles involved in the practice of farming in these schools are problems that yet await final solution. It is very encouraging, however, to note that our educationists, in practically all our provinces, are giving this important matter their careful thought and that as a result we have witnessed in recent years a distinct progress, more particularly in connection with the so-called nature study and the establishment of school gardens.

Of the agricultural colleges and schools in Canada, I have already briefly spoken. During the last decade their number has greatly increased, a most encouraging sign, looking towards the better education of those about to go on the land and towards the supply of trained men for educational and demonstrational work in our agricultural institutions. Of the work accomplished by these colleges I shall not speak in any detail, contenting myself on this occasion with the statement that I believe that it is eminently adapted to the needs of this country and that those who have it in charge are for the most part well cognizant of the character of education required by the sons of our farmers and are fully competent and qualified to impart it.

A phase of educational work that has been specially developed in Canada and which has proven most valuable is teaching by correspondence, the supplying through the mails, in response to individual requests, of information to farmers. The problems on no two farms are identical and the farmer has been encouraged to send forward his enquiries and difficulties, with regard to the management of his land and the crops for which it is best adapted, questions regarding rotations, manures and fertilizers, the breeding, care and feeding of life stock, the relative nutritive values of cattle feeds and fodders, the preparation and application of insecticides and fungicides. These and a thousand and one other matters relating to general and specialized agriculture are daily dealt with through the channel of correspondence. In this useful work of education through correspondence, the Dominion Experimental Farm system may justly claim to be the pioneer. From the first and steadily all through its history it has encouraged farmers to ask for information, to make known their difficulties and the response has been remarkable. It has amply proven the wisdom of its policy. To-day throughout Canada the Experimental Farm system is regarded by thousands and tens of thousands of farmers as a reliable bureau of information, willing and prompt to help as may be practical on all occasions.

To what extent other agricultural institutions in the Dominion participate in this work I cannot say. No doubt they all have their share, but the fact that farmers may forward their letters free of postage to the Central Experimental Farm would naturally, when taken in conjunction with our widely advertised offer of help, result in the sending of the major part of the agricultural correspondence of this country for the attention of the specialists at Ottawa.

Reference must also be made to the valuable educational work accomplished by the widespread dissemination of agricultural information through the distribution of bulletins, reports, circulars, etc., from the various agricultural institutions of Canada. The number of publications so issued and sent post free on application is very large. The demand for this literature is yearly increasing, indicating not only that it is acceptable, interesting and useful, but that our farmers are readers and therefore inclined to make their heads help their hands in their everyday work. Speaking of this literature as a whole—and I can do so from the fact that the greater part has emanated from the Experimental Farm system—it has been written in plain language with the intention of imparting its information clearly and concisely and in a way understandable by the non-technical reader.

Demonstrational work is closely related to the foregoing means of disseminating information and, indeed may be regarded as a subdivision or phase of educational work proper. It is the bringing home to the farmer in a very practical way modern and approved methods in farming operations. It is the showing how, and is comparable in its object to the value and influence of the lantern slides of the lecture and the illustrations of the text book. Since their institution the farms and stations of the Dominion Experimental system and the farms connected with our agricultural colleges have in a large measure been demonstrational—that is, as regards farming methods, farm buildings, etc.—but their influence in this direction by reason of their necessarily limited number, could not be widely and intimately felt throughout all the agricultural areas of the vast Dominion. This has led in recent years to the establishment of a number of small stations here and there in the districts most needing them—demonstration stations—upon which methods of soil management in respect to the conservation of moisture, the upkeep of fertility through crop rotation and many other important phases are exemplified. These demonstration or illustration stations, although but recently established, have already exerted a marked influence on the agriculture of the districts in which they are situated. It is quite evident that in these stations we have found an additional and very valuable means of improving farming methods, and the probability is that their number

will be increased in the more difficult and more backward of our agricultural districts.

The appointment of District Representatives is a recent and important movement, inaugurated by the Province of Ontario, but rapidly copied by other provinces—it marks the latest addition to the educational and demonstrational forces of the country. The District Representative is almost invariably a graduate of an agricultural college and a man born and raised on a farm. He is one therefore who has at first hand a practical knowledge of the principles of agriculture. He is versed in modern methods. His headquarters are at some fairly large centre in an agricultural district and his work is to assist with advice and by demonstration as far as may be practical all who may apply to him. The success of a district representative will naturally depend largely on his personality, his willingness and ability to impart information and his skill as a demonstrator. Though we cannot as yet say what place in our educational system this officer may take in moulding our agriculture, there is most satisfactory evidence that in many cases he is proving an inspiration to farmers and a means of raising the general condition of agriculture. There is very much to be said in favour of the movement, for we must be all agreed that, with the right men in this work, the personal contact of the teacher and demonstrator with the farmer must result in the betterment and progress of the district from the agricultural standpoint.

In this very brief review I have only touched upon the larger and more important means by which agricultural information of an agricultural character reaches the farmer. In concluding this phase of my address, I would say that the provisions in Canada in this connection are, on the whole, ample and excellent, and that every year sees their development and improvement. The great mass of farmers may, as yet, be outside and untouched by the influence of these educational agencies—though I should not like to endorse any such statement—but of two facts we may be well assured: that these several agencies are in the hands of well trained, able and enthusiastic men and women thoroughly imbued with the desire to help and that already may be seen the fruits of their work in profound changes for the better in the practice of Canadian agriculture.

Investigation or research in the domain of agriculture is the systematic, skilful application of the sciences—natural, physical and economic—to the solution of its problems. Its product naturally constitutes agricultural science. Its object, first, is to discover facts and secondarily is to correlate and co-ordinate them so that laws or principles may be established. Thus, successful research in agriculture adds to our definite knowledge regarding soils and crops and

livestock and enables us to propound improved methods for the conduct of the art or practice of farming. It seems clear to me that it is to agricultural science, and to this source alone, that we must look for that knowledge which can permanently advance our agricultural practice.

The problems of agriculture naturally cover a very wide field, and as a result are exceedingly varied; further, they are frequently very complex in their character. They call for profound uninterrupted and continuous study. As a rule they are difficult to solve, chiefly from the large number of factors and limiting conditions usually involved and the necessity of noting and accurately gauging their significance, before any interpretation of results can be attempted.

As in other departments, research in agriculture to be successful necessitates careful, skilful planning; there must be nothing of the haphazard in its conduct. It may proceed by experimental methods, but certainly not by a series of disconnected, unrelated experiments. It calls for a close, scrutinizing observation, clear thinking and a sound judgment, more especially in its field work, throughout its various stages and an ordered marshalling of the facts before their final interpretation. Throughout the whole work, I repeat, there must be system and scientific thoroughness, if the results are to be of permanent value and generally applicable.

I have spoken of experimental work as forming an integral part of investigation and research, for it is by experiment that we arrive at the facts, the facts necessary for the establishment of the principles. But the experimental work, taken by itself, is not necessarily of the nature of research. Isolated facts as the result, say, of field experiments, even if well proven by repeated and careful trials, seldom have any value for extended application. Much of the experimental work in agriculture to-day is of this nature, lacking scientific method, plan and completeness. The mere trying out of this and that in an indiscriminate matter, without any due regard to the laws of chemistry and biology that may be involved and without taking into account the numerous modifying factors and influencing conditions, without a study of the causes that may affect the results, while it may yield information of local importance, cannot add to the store of permanent knowledge of wide application. It is of little value for the enunciation of principles; in a word, it cannot advance agricultural science.

In saying this I do not wish to be understood as speaking derogatorily of the agricultural experimental work of which there is so much to-day, though certainly a good deal of it might be of greater value if conducted with more care and thoroughness. It has given

and is giving important information. The point I wish to emphasize is that much of it is not profound, that it does not explain, that it is limited in its value and in the application of its results, in a word, that it is not of the nature of true research. Let it be always borne in mind that the principles of agriculture, the outcome of research, are true the world over. If they do not hold good everywhere they are not principles. Rational farming methods are based on scientific principles; methods must be modified in different parts owing to the fact that conditions of soil, climate, etc., vary, but the principles upon which they are founded remain constant and permanent if they have been truly established.

For this research work we require well trained men and adequately equipped institutions. It is to the Universities alone that we can look for such men, men skilled in technique and sound in their knowledge of the sciences in which they are to labour. The broader and deeper the general education accompanying this special training the better prepared will the research worker be to cope with the many-sided problems that will continually present themselves. Some first hand knowledge of farm operations is most desirable to avoid pitfalls, but this can be obtained prior to or after the college course. As in other lines of investigatory work, a special aptness for or love of the work is, I believe, a great advantage, as is also the power of concentration and withal patience. We can scarcely expect the greatest measure of success without these qualities.

One of the objects that I had in mind in preparing this address was to call attention to the fact that our more important Universities have not as yet taken any leading or special part in this truly national work towards the improvement of Canadian agriculture, unless we consider as such their affiliation with the agricultural colleges—colleges situated at a considerable distance and not assisted in any way by the University science staffs. So far as I can see Canadian Universities have taken little cognizance of agricultural research, either in their undergraduate or postgraduate work—that is, if we except forestry, which is certainly to be regarded as a branch of agricultural science. This is exceedingly strange to me and a state of affairs that surely must have arisen from a lack of appreciation of the true character of agricultural science. It is scarcely necessary to remind you that research work in agriculture demands as deep and thorough knowledge of the natural and physical sciences as does other scientific research, as for instance medicine. Personally, I am very anxious that our Universities should make some provision for agricultural science on their curricula.

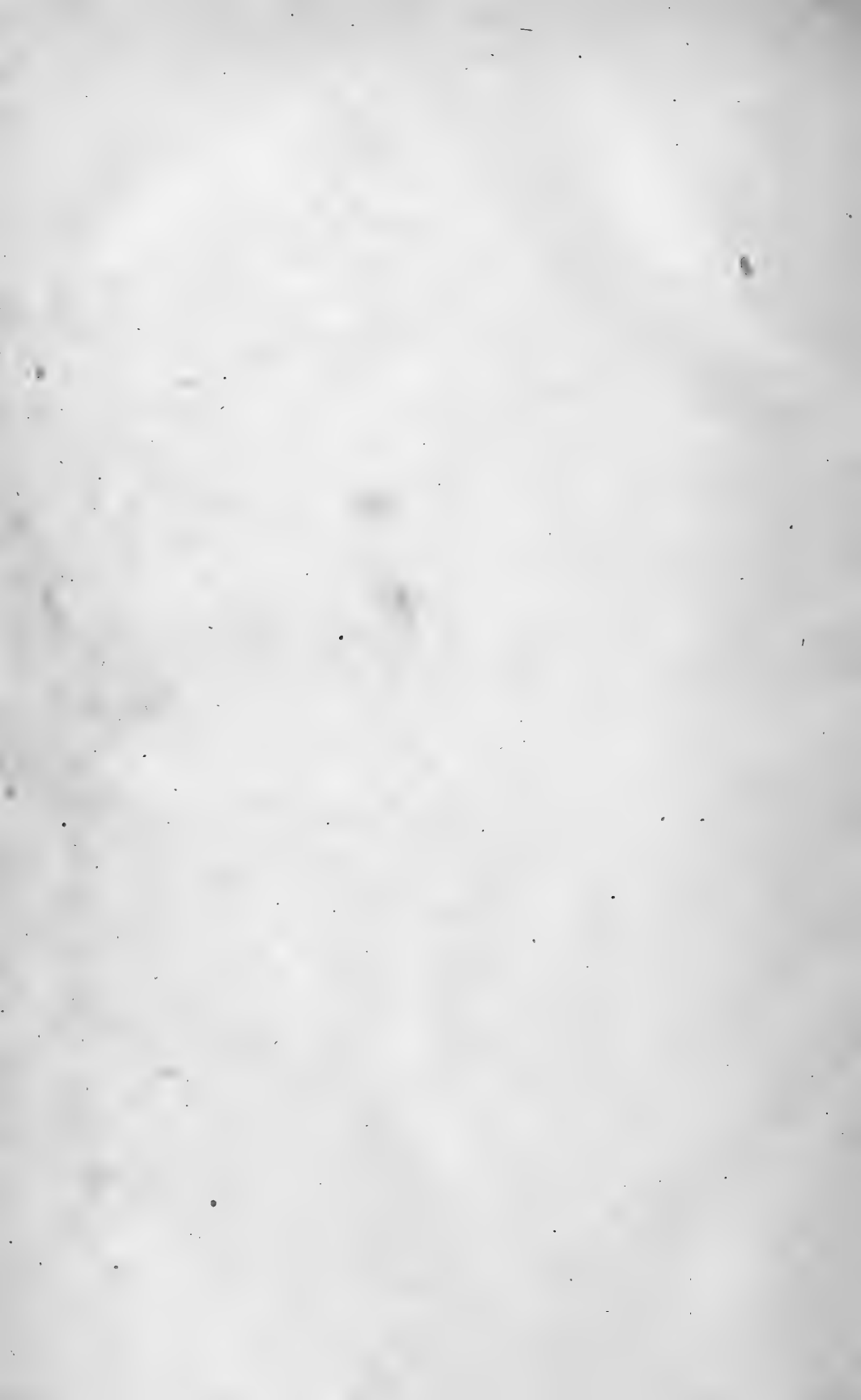
It is not my intention now to indicate how this may best be done, much less to dictate the steps to be taken by our Universities that within their halls agricultural sciences may be adequately recognized. I feel assured that if the governing bodies once realize that agricultural research work is worthy of university men—and their best men—ways and means will be forthcoming to find a place for it on their curricula.

In the mean time, there is one matter that I should like to emphasize; it relates more particularly to the work I am personally interested in—chemical work. It is the desirability of greater care and thoroughness in the teaching of analytical chemistry at our universities. I speak feelingly on this subject. Perhaps it is that this branch of chemistry is relegated to juniors who themselves are not well trained; possibly the classes are too large for close supervision and the individual guidance of its members, or possibly that analytical chemistry is not the vogue of to-day or thought very highly of in our universities as a part of a chemical education and therefore somewhat neglected. But whatever the cause, the fact remains that the larger numbers of our honour graduates in chemistry as they leave college are miserable analysts. They give little evidence of having been carefully trained in technique and manipulation. Their use and handling of apparatus and the conduct of analytical work is far from satisfactory. We ought to expect from these men a knowledge of correct methods in weighing, filtering, incinerating, the use of volumetric apparatus, the making and putting together of simple apparatus, and other every-day laboratory operations in analytical work, but they work as if they had “picked up” all the knowledge they have on such matters. The graduates of the English and Scottish Universities, I am sorry to say it, exhibit much better training; at least that is my experience. Reliable results, I am confident, cannot be obtained from sloppy, slipshod manipulation. In agricultural research work extreme accuracy is required—the highest accuracy obtainable. In this, I presume, it differs from much control work in manufacturing concerns. An error of .02 per cent in the amount of available potash in a soil may throw us all astray in the interpretation of the data. We do not expect from our recent graduates a knowledge of special methods used in agricultural work, but we do expect that the men should be able to perform correctly and fairly rapidly and with good technique those operations which form a part of all analytical procedure. And, if I may be permitted to say it, to give the men a hurried course of a fortnight or so towards the close of the college term in which a soil, a fertilizer, a cattle food and a dairy product is “put through” is worse than useless. The experience is bad, for it means

faults to be corrected once research work is entered upon, and much time is lost. Analytical work is an intellectual work, and it should be so regarded by those teaching it in our universities, but it should also be taught as a fine art in which correct technique counts largely in the value of the results. It seems to me that in the making of a good analyst it is just as important to pay attention to technique as it is in the training of the piano student who would later on hope to correctly interpret a Bach fugue or a Beethoven sonata.

As to institutions in which this work is to be carried on, we have first, of course, the Dominion Experimental Farm system, and secondarily, to some degree at least, the larger and better equipped of our Agricultural Colleges. If the work is to be restricted to these institutions it will be necessary to give them the means and men for the necessary development. There is a great deal of work ahead of us in this field. To the universities, I offer the consideration of establishing fellowships and post-graduate courses in agricultural science. This surely would not be impossible. There are many problems eminently suited to the conditions obtaining at several of our larger universities, which could furnish subjects for post-graduate work.

And I have also in mind the desirability of the establishment of a Canadian Institute of Agricultural Research, wherein the more abstract and difficult problems of agriculture could be patiently and uninterruptedly studied. Other countries have such institutions and the value of their work has amply justified the expenditure. It is a big project, but not too big for Canada. Under the joint control of the Government and the universities such an institution could do a most valuable national work. The day will come, I think, when we shall favourably consider the establishment and endowment of such an institution. It would be a worthy object and a useful channel for the appropriation of public funds, unless it be, in the meantime, that it has attracted private benefaction. What more splendid memorial could be erected by those, who, having the means, wish to leave a legacy ever increasing in value to their country, one that in its assistance to our national industry, could forward the development and the welfare of the Dominion.



*Factors Connecting the Concentration and the Optical Rotatory Power
of Aqueous Solutions of Nicotine*

BY ALFRED TINGLE AND ALLAN A. FERGUSON

Presented by PROFESSOR W. R. LANG, F.R.S.C.

(Read May Meeting, 1916.)

INTRODUCTION

Our object in undertaking the investigation here described was to find answers to the following questions:

1. Is the rotatory power of a dilute aqueous solution of nicotine (4% or less) proportional to its concentration?
2. Is the rotatory power of an aqueous solution of nicotine changed by the presence in the solution of free alkali or salts of alkali metals?
3. When an acid solution of nicotine sulphate is evaporated, is any nicotine lost by vaporisation? Is there any loss of rotatory power for any other reason, such as the occurrence of racemisation.
4. What is the rotatory power of nicotine in dilute aqueous solution?

The answers to these questions have more than an academic interest. Several polarimetric methods for the determination of nicotine have been proposed, the accuracy of which must fundamentally ally depend on the answers given to questions 1 and 4. We have devised a new polarimetric method of our own, to prove the reliability of which we must answer satisfactorily all the questions raised above.

At the same time it should be noted that our determinations were made with an instrument designed for sugar work, and to use other than "D" light. The consequence is that the rotatory power of nicotine solutions, as determined by us, is useless for many purely scientific purposes. Our choice of instrument was dictated by the practical considerations that it is the one most often found in analytical laboratories, and that it is extremely sensitive.

Previous workers seem to have assumed without experimental investigation that question 2 was to be answered in the negative.

Question 3 has never been raised before, as far as we are aware.

There is a marked difference of opinion among chemists as to both 1 and 4. Our own answers appear to ourselves to be quite con-

clusive. We believe that the only question left even partly open is 4, and that only to the extent that the most carefully conducted quantitative determination is always subject to revision.

Experimental

The polarimeter used in all the experiments here recorded was a Schmidt & Haensch Triple Field instrument, graduated to read in Ventzke sugar divisions (to 0.1 division) of the dimensions fixed for "j" light. Where our figures are carried to a second decimal place this indicates that they are the mean of two or more readings differing by not more than 0.1 division. The length of the polariscope tube used in all these experiments was 2 d.m. The source of light was a tungsten incandescent lamp, suitably shaded. All readings are given in Ventzke sugar scale divisions of "j" light dimension. Observations were made at 24°, which may be considered an average laboratory temperature.

Influence of Dilution on the Rotatory Power of Aqueous Nicotine Solutions. Our experiments on this point were made in two series.

Series A. Pure nicotine was dissolved in water, giving Solution I, the strength of which was approximately 2.5%. Solution II was obtained from this by diluting 250 cb.c. to 500 cb.c., while Solution III was in turn obtained by diluting 50 cb.c. of II to 100 cb.c.

Series B. Solution I was made by dissolving pure nicotine in water, its strength being approximately 1.5%. The dilution of 50 cb.c. of this solution to 100 cb.c. gave Solution II, while 25 cb.c. of Solution I diluted to 100 cb.c. gave Solution III.

The rotatory power of these six solutions was then determined. The results are shown in the following table.

Series A.		Series B.	
Solution number	Observed Rotation in Sugar Scale Divisions	Solution number	Observed Rotation in Sugar Scale Divisions
I	- 11.8	I	- 6.7
II	- 5.9	II	- 3.35
III	- 2.95	III	- 1.7

These results show clearly the directness of the relation between the dilution and rotatory power of the solution examined. Their bearing will be discussed later.

Effect of Free Alkali and Alkali Salts on the Rotatory Power of Nicotine Solutions. Effect of Evaporation in the Presence of Sulphuric Acid.

Experiment 1. An aqueous solution of nicotine was prepared, its strength being approximately 0.5%. To 100 cb.c. of this solution a slight excess of sulphuric acid was added. The product was evaporated to small bulk on the water bath. It was then cooled, and potassium hydroxide solution was added till the whole was strongly alkaline. The mixed solution was diluted to the original volume (100 cb.c.) and was compared in the polarimeter with the original nicotine solution from which it had been produced.

Both liquids gave a rotation of -2.6 sugar scale divisions, showing that the treatment detailed had had no effect on the rotatory power.

Experiment 2. To 50 cb.c. of an aqueous solution of nicotine (approximately 20%) an excess of sulphuric acid was added. The mixture was evaporated to small volume, partly neutralized, made up to 50 cb.c. again, and 25 cb.c. of this solution was again evaporated with an excess of sulphuric acid. The concentrated solution was made alkaline and diluted to 50 cb.c.

The original solution read -8.6 and the final product -4.3 in the polarimeter. The latter figure absolutely agrees with what was calculated on the assumption that the rotary power would be proportional to the dilution and independent of the presence of salts, of alkali, and of repeated evaporation with acid.

Experiment 3. To 200 cb.c. of a nicotine solution (approximately 0.7%) an excess of sulphuric acid was added. It was then evaporated, made alkaline, and the volume made up to 100 cb.c.

The concentrated solution so obtained gave a reading -6.65 in the polarimeter, while the original solution from which it was prepared read -3.3 . Agreement between the figures expected and obtained was therefore again within the limit of error.

Determinations of the Rotatory Power of Nicotine in Dilute Aqueous Solution. The nicotine purchased for the determination of this constant was Mercks' "C.P." article. We found it grossly contaminated not merely by the presence of oxidation or polymerisation products such as we expected, but also by the presence of some high-boiling hydrocarbon oil, which had probably been used as a solvent and not completely removed.

Preparation of Pure Nicotine. The above impure product was dissolved in dilute hydrochloric acid. The hydrocarbon was removed by shaking with chloroform and the aqueous layer was transferred

to a distilling flask, made strongly alkaline, and distilled in a current of steam. Nicotine was extracted from the distillate by shaking it twice with chloroform. The chloroform solution was dried over potassium hydroxide, filtered, and heated on the water bath till as much of the chloroform as possible had been expelled. The residue of nicotine was still rather dark coloured. It was finally purified by distillation in a reducing atmosphere, the first runnings of the distillate being rejected as probably contaminated with chloroform.

To produce the reducing atmosphere a stream of illuminating gas was employed. It was first passed through a quartz tube heated at one point by a blast lamp. Thence it was passed in succession through a strong solution of potassium hydroxide, strong sulphuric acid, and a column of dry granulated calcium chloride, after which it reached the distillation apparatus.

The nicotine produced by the above process was colourless and almost devoid of smell. It mixed with water without the formation of any cloud.

Determination No. 1. A sample of nicotine, purified as above, weighing 8.6416 grammes, was dissolved in water, made up to 250 cb.c., and thoroughly mixed. On examination in the polarimeter this solution read -15.7 Ventzke sugar scale divisions. A reading was taken again and found unchanged after standing for twenty-four hours. This corresponds to a negative rotation of one division for 0.22016 gramme of nicotine in 100 cb.c. of solution.

Determination No. 2. The sample of nicotine, purified as above but from another preparation, weighed 8.6068 grammes. It was dissolved in 250 cb.c. of water and treated exactly as in the previous case. Polarimeter reading, -15.8 sugar scale divisions, so that one division corresponded to 0.21789 gramme of nicotine in 100 cb.c. of solution.

Determination No. 3. This sample was from the same preparation of nicotine used in No. 2. The weight taken was 4.2282 grammes, which was dissolved in 100 cb.c. of water. Polarimeter reading was -19.1 sugar scale divisions, so that one division corresponded to 0.22137 gramme of nicotine in 100 cb.c. of solution.

Taking the mean of all three determinations we find that a negative reading of one Ventzke sugar scale division corresponds to 0.2198 gramme of nicotine in 100 cb.c. of solution. For practical purposes we may take the figure to be 0.220.¹

¹The better to assure ourselves of the correctness of the polarimeter readings in these three determinations, we availed ourselves of the assistance of Miss Florence M. Burt, Sugar Tester to the Customs Department, who is naturally more expert than most chemists in the use of this instrument. Her readings exactly agreed with ours. We wish to express our thanks for the aid thus kindly rendered.

We wished to make, if possible, a further determination by some method which did not involve the direct weighing of such an unstable and hygroscopic substance as nicotine. The only well-crystallised salt of this base which seemed suitable for the purpose was the "bi-tartrate" described in Beilstein's Handbuch as having the formula $C_{10}H_{14}N_2 \cdot 2C_4H_6O_6 \cdot 2H_2O$. We prepared a salt from nicotine and tartaric acid which we re-crystallised from alcohol with the addition of a little ether, and which answered to the description of the above compound, but appears to have a different composition. Unfortunately we had no facilities for making an ultimate analysis. A volumetric determination of the tartaric acid present showed 63.75%, corresponding closely to the 63.69% demanded by the formula $2C_{10}H_{14}N_2 \cdot 4C_4H_6O_6 \cdot H_2O$. No direct determination of water of crystallisation was possible, as the salt melts and decomposes at a somewhat low temperature.

A sample of this salt, weighing 10 grammes, was dissolved in a 100 cb.c. graduated flask, the solution was made strongly alkaline with sodium hydroxide, and an excess of calcium chloride solution was added. The whole was made up to 100 cb.c. after standing overnight, and the solution was filtered through a dry paper. On examination in the polarimeter the filtrate was found to give a negative rotation of 15.9 sugar scale divisions. The formula we suggest for this tartrate corresponds to 34.39% of nicotine. Our sample would then contain 3.439 grammes of the base, and according to this determination one sugar scale degree = 0.216 gramme of nicotine in 100 cb.c. Uncertainty as to the composition of the salt, and the large amount of precipitate formed in the solution, alike render this determination of less value than we had hoped, but it is in sufficiently good agreement with the preceding ones to strengthen our confidence in their accuracy.

We satisfied ourselves that the tartrate remaining in solution was too small to have any effect on the rotatory power by the following experiment. A solution was made of 7.2 grammes of "Rochelle Salt" and 2.8 grammes of sodium hydroxide in 20 cb.c. of water. To this was added 30 cb.c. of a saturated solution of calcium chloride. The mixture was allowed to stand overnight, filtered and examined in the polariscope. It showed no rotatory power.

Discussion of Results.

It has been stated by Popovici (Zeit. physiolog. Chem. 13.445) that the nicotine content of a solution is not proportional to its rotatory power. He gives a table showing the relation between the percentage of nicotine in a solution and the rotatory power as deter-

mined by his own experiments. This table shows a steady fall in the amount of nicotine corresponding to one minute of angular rotation, the determination being made upon solutions ranging in strength from 4.00% to 0.25%.

Pribram (Ber. deut. Chem. Ges. 20.1840) states that the diminution in the rotatory power of aqueous nicotine solutions is irregular, and does not decrease in proportion to the dilution. The irregularity seems most marked, according to his statements, at concentrations between 4% and 0.8%.

On the other hand J. A. Emery (Jour. Amer. Chem. Soc. 26.1113) found the rotatory power of aqueous nicotine solutions to be proportional to the concentration between 1.2% and 0.4%, but his statement rests on only two determinations.

We consider that our own experiments show that, within the range of accuracy of our instrument and for concentrations between 4.0% and 0.37%, the rotatory power of an aqueous solution of nicotine is strictly proportional to its concentration.

We thus find ourselves in agreement with J. A. Emery, who appears to have used the same type of instrument that we did. It is possible, though hardly likely, that the irregularities found by Pribram and Popovici are connected with the wave length of the light used. The last mentioned observer gives no clue to the method he employed for determining the nicotine concentration of his solutions. If this was done by titration the results would necessarily be inexact.

Our experiments also show, as we anticipated would be the case, that repeated evaporation with sulphuric acid in small excess does not cause any change in the rotatory power of nicotine. The rotatory power of aqueous nicotine solutions is not affected by the presence of free caustic alkali or salts of the alkali metals.

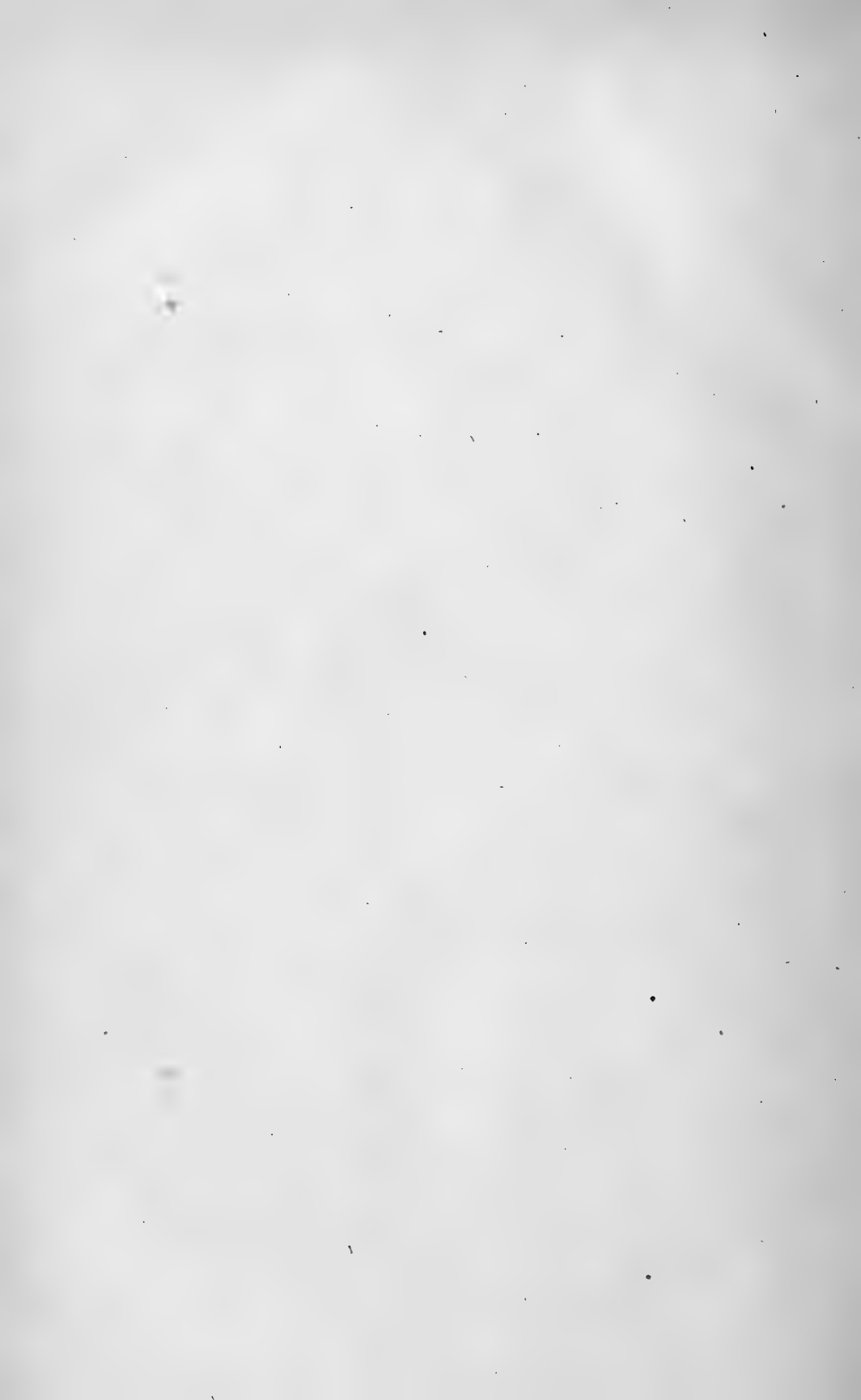
We find that the rotatory power of nicotine in water is such that, examined in a 2 d.m. tube, 1 gramme of nicotine in 100 cb.c. of solution would give a negative rotation of 4.5 divisions on the Ventzke sugar scale for "j" light, or conversely, a negative rotation 1 division corresponds to 0.2198 gramme of nicotine in 100 cb.c.

According to Emery's determination (*loc. cit.*) of the same factor, rotation of 1 division = 0.224 gramme of nicotine in 100 cb.c. In criticism of this figure it may be pointed out that it rests on only two determinations and that these, while based on the same principle as our own, were made on very much more dilute solutions (1.233% and 0.404%) than we employed. While Emery increases the probable accuracy of his polarimeter reading by using a 4 d.m. tube, this increase does not fully compensate for the diluteness of his solutions.

Further, Emery gives no indication of how he purified the nicotine he employed. Any impurity left in his nicotine would tend to make his determinations differ from ours in exactly the sense that they do. The difference between us is, however, very small.

Our results, expressed as they are in Ventzke Sugar scale divisions for "j" light may be converted into circular degrees by those who find that system of measurement more convenient, using the factor $1 \text{ V sugar scale div.} = 0.3906 \text{ circular degree}$. It is to be noted, however, that the circular measurements so calculated are not identical with the figures which would be obtained by working with "D" light, so that their utility is limited almost entirely to the analytical purposes to serve which this work was undertaken.

If we may assume that Popovici worked with the same light that we employed, it will be seen that his nicotine had a much lower rotatory power than ours. He gives for a 1% nicotine solution a rotation of $1^{\circ} 29'$ circular measure, whilst our determinations show that this should be $1^{\circ} 57'$. This difference would be accounted for if his nicotine was impure, or if he used "D" light.



A New Method for the Determination of Nicotine in Tobacco

BY ALFRED TINGLE AND ALLAN A. FERGUSON

Presented by PROFESSOR W. R. LANG, F.R.S.C.

(Read May Meeting, 1916.)

INTRODUCTION

Although it has been accepted as a standard for many years, Kissling's method of determining nicotine in tobacco and tobacco extracts is not at all an ideal one. J. A. Emery has pointed out (Jour. Amer. Chem. Soc. XXVI, 1113) how completely it fails when applied to certain tobacco extracts and has proposed an improved method of his own for use in these cases. This depends in part on polarimetric observation. Our own experience has led us to think well of Emery's method, despite the rather cavalier way in which it is dismissed by R. M. Chapin (U. S. Dept. of Agriculture, B.A.I. Bulletin 133).

Emery also tried (*loc. cit.*) to determine nicotine in tobacco leaf by two methods. According to the first he followed Kissling's procedure for the most part, but modified it by diluting the final distillate to 500 cb.c. and measuring the rotatory power of the resultant solution. For reasons to be given later we do not consider this method practical.

His second proposal turned on the steam-distillation of the tobacco to be examined, after mixing it with a solution of caustic alkali. This solution causes much trouble by frothing and bumping; Emery confesses to having obtained only poor results.

Cox (Pharm. Jour. Jan. 20th, 1894), mixed tobacco with slaked lime, and distilled in a current of steam. We found that this mixture also gave much trouble by frothing, and our experiments generally ended in the whole contents of the distilling flask being projected down the condensor.

We have found that when barium hydroxide in large quantity is substituted for the caustic alkali or lime in the foregoing methods, all the nicotine can be distilled over in steam, and that no precautions against frothing are needed. The operation can be carried on as quietly and easily as any steam distillation we have ever performed.

The method which we propose for determining nicotine in the distillate is a polarimetric one. Its accuracy therefore depends

fundamentally on the correctness of certain assumptions as to the polarimetric behaviour of aqueous nicotine solutions.

These assumptions are:

1. That the rotatory power of a solution of nicotine in water is not changed by the presence of alkalis or salts of alkalis in the solution.

2. That acid solutions of nicotine sulphate may be evaporated without either loss of nicotine by vaporisation, or the occurrence of racemisation.

3. That the rotatory power of an aqueous solution of nicotine containing three per cent of the base, or less, is proportioned to its concentration.

We believe experimental proof of the above has been satisfactorily furnished by us in the preceding paper. (This Journal X. 10.)

In the same place will also be found details of our determination of the rotatory power of nicotine in dilute aqueous solution. It is obvious that till this constant is known with reasonable accuracy no polarimetric determination of nicotine is reliable.

Experimental

We propose two alternative methods for the determination of nicotine, one of which is a slight modification of the other. These methods will be best understood by describing in detail their application to a particular case. For the sake of comparison details of determinations made on the same tobacco by the methods of Kissling and of Tóth are also given.

The tobacco used in the following experiments was Canadian-grown leaf, dried at 110° , powdered, and passed through a 60-mesh sieve.

Experiment 1, New Method. The sample, weighing 20 grammes, was placed in a 500 cb.c. flask with 40 grammes of barium hydroxide and 150 cb.c. of water. This mixture was distilled in a current of steam, gently at first, but afterwards as rapidly as was convenient. The heating was so arranged that the volume of mixture in the distillation flask was ultimately reduced by about one-half. Distillation continued till a drop falling from the condenser gave no alkaline reaction with phenolphthalein. The whole distillate was then acidified by the addition of twenty cb.c. of sulphuric acid, transferred to an open dish, and evaporated on the water bath to about 50 cb.c. The concentrated solution thus obtained was again transferred to a 100 cb.c. graduated flask, the evaporating dish being carefully washed and the washings added. The solution, thoroughly cooled, was made strongly alkaline by the addition of an excess of concentrated potassium

hydroxide solution, followed by a few drops of baryta water. This last addition is not essential, but tends to clarify the solution when any turbidity has developed. The contents of the flask were next made up to the 100 cb.c. mark and the precipitate was allowed to settle. The supernatant liquid was decanted through a dry filter, and the filtrate examined in polarimeter.

A Schmidt & Haensch Triple Field instrument, graduated to read in Ventzke sugar divisions "j light," of which divisions $2.56 = 1^\circ$ circular, was used. The source of light was a suitably shaded tungsten incandescent lamp.

Viewed in a 2 d.m. tube the above solution read -2.05 sugar divisions (-0.7907° circular) as a mean of two observations. We have already shown (*loc cit.*) that a rotation of -1.0 sugar division corresponds to 0.2198 gramme of nicotine in 100 cb.c. of solution. Therefore the total amount of nicotine found in this sample was 0.4505 gramme or 2.25% .

Experiment 2. New Method (modified). A sample of the same tobacco, weighing 14 grammes was taken. This was mixed with 150 cb.c. of water and 15 grammes of barium hydroxide. Distillation proceeded exactly as in the foregoing experiment. The distillate was not acidified, but was extracted with chloroform four times in succession, 30 cb.c. of chloroform (which must be free from acid) being used for each extraction. The chloroform extracts were collected in another separating funnel and shaken twice with *N.* sulphuric acid, using 15 cb.c. for the first, and 10 cb.c. for the second operation. The combined acid solutions were run into a 50 cb.c. graduated flask and warmed to expel the dissolved chloroform. A few drops of baryta water were added and the solution was cooled. Aqueous potassium hydroxide solution was added till present in excess, and the contents of the flask were made up to the 50 cb.c. mark and filtered.

The filtrate, examined polarimetrically under the same conditions as that in the previous experiment, read -2.9 sugar divisions (-1.1327° circular). This corresponds to 0.6374 gramme of nicotine in 100 cb.c. or a total of 0.3187 gramme in the 14-gramme sample and therefore 2.27% .

Experiment 3, Tóth's Method. That we might compare our own method with this well known one, we took a sample of the same tobacco weighing six grammes and rubbed it up with 10 cb.c. of a 20% sodium hydroxide solution. To this was added a convenient quantity of plaster of Paris. The mixture was then well shaken with 60 cb.c. of ether and 60 cb.c. of petroleum ether in a stopped

vessel. It was shaken and allowed to settle alternately for an hour, at the end of which time 50 cb.c. of the ether solution (20 cb.c. as in the original directions, would have been too little) was withdrawn for titration. To this ethereal solution an excess of water was added and the whole was titrated with approximately N/5 sulphuric acid (1 cb.c. = 0.03382 gm. nicotine) using lacmoid as the indicator.

Acid required 1.4 cb.c. = 0.04734 gramme nicotine = 0.1136 gramme in total sample or 1.89%.

Experiment 4, Kissling's Method. For comparison of our own with this method, a sample of the same tobacco weighing 20 grammes was mixed with 10 cb.c. of sodium hydroxide solution (6 grammes of sodium hydroxide in 40 cb.c. of water and 60 cb.c. of alcohol) transferred to a Soxhlet apparatus and extracted with ether for five hours. The ethereal solution was then evaporated at a gentle heat, the residue was mixed with 50 cb.c. of N. sodium hydroxide solution and transferred to a distillation flask with the aid of water. After distilling in a current of steam till about 400 cb.c. of distillate had been collected the portion which still passed over was no longer alkaline.

The whole distillate was titrated with sulphuric acid, using lacmoid as indicator, and required 10.3 cb.c. for neutralisation. Since 1 cb.c. of acid = 0.03382 gramme of nicotine, this corresponds to 0.3483 gramme of nicotine in the sample, or 1.74%.

Discussion and Comparison of Methods

It will be noticed that the two modifications of our method give results as nearly as possible identical with one another, but higher than those given by the methods of either Tóth or Kissling. We have devoted careful consideration to the possible errors of our own method. All of them tend, however, in the direction of giving a result that would be too low rather than too high, and we are left with a preference for our own procedure both on considerations of accuracy and ease of working.

Our main objection to the method of Tóth is that the original weight of the sample worked on is necessarily small; even when a large aliquot portion of the solution is titrated, only a small quantity of acid is needed, so that there is a correspondingly great chance of error. Had 0.25 cb.c. more acid been used in the experiment described above, the corresponding increase in the apparent amount of nicotine would have been 0.36%, bringing the Tóth determination into exact agreement with our own.

The objections to the method of Kissling are well known. Its good results are recognized as being due to balancing errors. As applied to tobacco extracts containing pyridine or its homologues, it is acknowledged that the methods of Tóth and Kissling are alike useless.

The method proposed by Emery for the determination of nicotine in tobacco only differs from that of Kissling in that the final distillate instead of being titrated is diluted to exactly 500 cb.c. and then examined polarimetrically. Our objection to this method is two-fold. Firstly, it perpetuates the danger inherent in the Kissling method, of losing nicotine, while it removes the compensating error of the possible retention of ammonia; secondly, it gives readings on the polarimeter so low that the probable error of observation becomes relatively high.

As an example of this last objection we may take the results given in our own Experiment 1 quoted above. Had the distillate in this case been diluted to 500 cb.c. and examined in a 4 d.m. tube, the rotation would have been only -0.8 sugar divisions (-0.3124° circular). Further, in our experience the polarimeters most frequently in use will not accommodate so long a tube. If a 2 d.m. tube were used, the rotation would be -0.4 sugar divisions only. We consider therefore that Emery's method for tobacco would entirely fail in practice. Our own, especially as modified in Experiment 2, is much quicker than his.



The Smelting of Titaniferous Ores of Iron

BY ALFRED STANSFIELD, F.R.S.C., and W. A. WISSLER

(Read May Meeting, 1916.)

The industrial development of a country depends very largely on its supplies of the basic materials of engineering, notably coal and iron. Canada's production of pig iron is about one million tons a year, while Great Britain produces ten million, the United States thirty million, and the world seventy-five million tons. One million tons a year may seem a fair production for so young a country as Canada, which has as yet a very limited market, but the situation will be found less satisfactory when it is pointed out that nine-tenths of Canadian pig iron is made from imported ore. The furnaces of the Dominion Iron and Steel Company at Sydney and the Scotia furnace at North Sydney, are fed with ore from the Wabana mines in Newfoundland, and the furnaces at Sault Ste. Marie and other parts of Ontario employ in large measure both iron ore and coal or coke imported from the United States.

We have been informed that Canada has a boundless wealth of all natural resources, but when we begin to enquire in detail into the supplies of iron ores we find that in general, the quality of these ores is poor and the quantity decidedly limited, and as has recently been pointed out by Mr. G. C. Mackenzie, Canadian ores require in general, to be improved in one way or another before they can be economically smelted.

There are, in eastern Canada, immense deposits of titaniferous magnetite ores, but these are not acceptable to blast furnace managers and are not at present recognized as available ores of iron. In view, however, of the scarcity of easily smelted Canadian ores, it is becoming increasingly important to ascertain whether such ores can be made available and whether it may not be possible to smelt these titaniferous magnetites economically.

As an example of such ores, we may mention the deposit of titaniferous magnetite near St. Charles on the Saguenay river. Prof. Dulieux¹ estimates the deposit to contain from one million to five million tons of ore. By crushing these ores to a powder and passing them through a strong magnetic field it is possible to make a partial

¹ Les Minerais de fer de la Province de Québec, Gisements et Utilisation, par R. E. Dulieux, Dept. of Mines, Quebec, 1915.

separation between the iron and the titanium as the iron minerals are more magnetic than those of titanium, but the iron and titanium minerals are too closely associated to permit of a perfect separation. Magnetic concentration would in general be used to enrich titaniferous iron ores as far as practicable before submitting them to the smelting operation.

Titanium in an ore is not objected to as lowering the quality of the resulting pig iron, as it is admitted that the iron produced from titaniferous ores is frequently of a very high quality, but such ores are more difficult and costly to smelt and it has been supposed that an ore containing so little as one per cent of titanium would be almost impossible to smelt in the blast furnace. It should also be remembered that magnetites, even when free from titanium are not so easily smelted as hematites, and that blast furnace managers prefer to import the easily smelted American hematites instead of using the Canadian magnetites, partly because they do not understand the correct treatment of magnetites.

Until quite recently the situation with regard to the smelting of titaniferous ores was substantially as follows:

(1) Fifty or sixty years ago titaniferous ores were smelted without serious difficulty in the small charcoal furnaces then in use.

(2) It has generally been supposed, in more recent practice, that titaniferous ores are very difficult if not impossible to smelt; so little as one per cent of titanium being sufficient to make an ore infusible in the blast furnace. It was supposed that titanium makes the slags sticky and further that it forms infusible accumulations of cyanonitride of titanium, which eventually choke the furnace.

(3) A. J. Rossi has, for a number of years, advocated the use of titaniferous ores; stating that they are in no way more difficult to smelt than other ores, providing that the titanium is properly fluxed. He states that titanium oxide, TiO_2 , in an iron ore should be regarded as equivalent to an equal amount of silica, and sufficient limestone provided to flux it; dolomite, moreover, being found to serve better than limestone as a flux.

In view of these contradictory views much doubt has prevailed. The positive statements of Rossi have greater weight than the vague prejudice against the use of such ores, but there has been a feeling that Rossi might be biassed in his views and that there must be some foundation for so widespread a prejudice.

It should be explained that ordinary iron ores contain an oxide of iron, with silica, alumina, etc., and that limestone is added as a flux. The oxide of iron is reduced to the metallic state almost completely while the oxides of aluminium and of calcium remain unreduced.

Silica is reduced to a small extent, furnishing one per cent or two per cent of silicon in the iron, but in general remains unreduced. When fusion takes place, the reduced metals (iron and silicon, with dissolved carbon), form the pig metal, while the unreduced oxides, silica, alumina, lime, and any unreduced iron oxide form the slag. In smelting titaniferous ores it is desired in general to obtain the iron in the metallic state and to leave the titanium unreduced so that it will pass into the slag as an oxide. Titanium is less easily reduced than iron, but about as easily as silicon, so that in smelting an ore that is rich in titanium, about as much titanium as silicon will enter the pig iron. Metallic titanium, if present in any considerable amount, is liable to cause trouble in the furnace by combining with the cyanides, that are always present, to form the well known copper coloured cyano-nitride of titanium, which ultimately causes serious obstructions in the furnace. To avoid the reduction of titanium it is necessary either to use a very large amount of flux, so as to reduce the proportion of titanium in the charge and to remove it almost completely in the slag, or else to have so moderate a reducing action in the furnace that the titanium remains almost entirely unreduced. With poor reduction the silicon entering the pig iron will also be small in amount and the pig will be "white" or "forge iron." Foundry iron, high in silicon, cannot be produced from a highly titaniferous ore.

In view of the scientific interest attaching to the reduction of titaniferous ores and to the economic importance of learning how to utilize the immense deposits of these ores in Canada, the authors have made a number of experiments on the subject. These experiments are not sufficiently numerous to enable a complete report to be made, but in view of the interest of this subject it appears desirable to present these observations (although incomplete) without any delay.

The experiments consisted of attempts to smelt a titaniferous ore containing about 6.5 per cent of titanium and of a series of determinations of the melting points of titaniferous slags. The smelting tests were carried out in an electric furnace as this is far more easily operated, on the small scale, than a blast furnace. The first test was made with a charge calculated on the assumption recommended by Rossi that titania¹ should be considered as equivalent to an equal amount of silica. The charge was also arranged with a view to making foundry iron. The test demonstrated the difficulties that will be met under these conditions. A number of experiments were then made to find the composition of fusible slags of titanium, and finally a second smelting test was made using the fluxes indicated by the fusion point

¹ The authors suggest the use of the word "titania" in place of "titanium oxide" or "titanic acid."

tests, and also arranging for the production of a low-silicon pig iron. This smelting test proved satisfactory.

First Smelting Experiment.

February 17th, 1916

The electric smelting test was made in the furnace shown in Figure 1. It was fourteen inches long, nine inches wide, and fifteen inches high inside; built of fire brick, and held together by iron straps and bolts. The bottom of the furnace had a lining of coke and pitch rammed in while hot around the electrode C, and a tap hole D served for the removal of the molten metal and slag. Two electrodes A and B were supported by water-cooled holders carried by arms G and H, by means of which the electrodes could be raised or lowered in the furnace. The furnace was operated with three-phase current at about 30 volts. This arrangement was convenient in view of the electrical supply, but had the effect of raising the fusion zone too high between the electrodes and is consequently not recommended. It would be preferable to use single phase current with one upper electrode and a furnace about nine inches square. F is a water-cooled holder for the electrode C, and E is a mould into which the molten metal and slag are tapped.

The ore employed in the smelting tests was obtained from the Orton mine, Hastings county, Ontario; being the same that was used some years before in experimenting on the Evans-Stansfield process for the production of steel, directly from the ore, in the electric furnace.¹ The ore was found to contain:

Fe ₃ O ₄ (assumed).....	69.02%	(Fe 49.91%)
TiO ₂	10.81%	(Ti 6.5 %)
Al ₂ O ₃	4.01%	
CaO.....	5.53%	
SiO ₂	1.84%	
	<hr/>	
	91.21%	
	<hr/>	

¹ Alfred Stansfield, "The electric furnace," 1914, Ed. p. 259.

The ore was smelted with the addition of charcoal and limestone, having the following composition:

<i>Charcoal</i>		<i>Limestone</i>	
Moisture.....	2.2%	CaCO ₃	96.22%
Volatile matter.....	25.0%	(CaO, 53.95%)	
Fixed Carbon.....	69.9%	MgCO ₃	1.43%
Ash.....	2.9%	(MgO, 0.68%)	
		SiO ₂	2.62%
		Fe ₂ O ₃ + Al ₂ O ₃	0.98%
	<hr/> 100.0 <hr/>		<hr/> 101.25 <hr/>

The smelting charge was calculated on the assumption that titania would replace silica in the slag (as indicated by Rossi) so that the lime should be made about equal to the sum of silica, alumina, and titania. It was assumed that the resulting pig metal would contain about one per cent of silicon and one per cent of titanium, and the amount of charcoal needed was based on the assumption that the iron, silicon and titanium entering the pig metal would be reduced by the fixed carbon (the volatile matter being supposed to be lost) and that the reaction would yield carbon monoxide only.

An addition of 20 per cent was made to the calculated amount of charcoal to allow for the mechanical loss of charcoal dust which is blown out of the furnace by the escaping gases. The final charge was:

Ore.....	89 lbs.
Limestone.....	19.5 lbs.
Charcoal.....	23.2 lbs.

The ore and limestone were crushed to one-quarter of an inch size and all the dust that would pass a one-twenty-fifth of an inch opening was separated. The charcoal was crushed to three-quarters of an inch size, and all the fines below one-quarter of an inch size were separated. The fines from the ore, limestone and charcoal were all mixed together and agglomerated by the addition of water and 3.5 lbs. of water glass; the damp mixture being allowed to dry, when it became hard and was mixed with the coarse ore and limestone. The lump charcoal was kept separate and charged into the furnace alternately with the other materials.

The smelting operation lasted for four hours, the furnace using on an average 26.1 K.W. at 30 volts, the measurements being made at the low voltage bus bars; the current supplied to each of the upper

electrodes was about 450 amperes. The smelting began satisfactorily, but became slower owing to the accumulation of infusible materials in the furnace. The slag was barely fusible and there was also an excess of charcoal and of lime. The products were as follows:

		<i>Slag analysis</i>	
Iron.....	31 lbs.	TiO ₂	24.51%
Slag.....	28 lbs.	SiO ₂	8.31%
Lime and ore unfused...	12.5 lbs.	Al ₂ O ₃	12.10%
Charcoal.....	4.2 lbs.	CaO.....	48.93%
		MgO.....	3.12%
		FeO.....	2.15%
			<hr/>
			99.12%
			<hr/>

The iron was white; but some of it, which had penetrated into the carbon lining of the furnace, was found, on fracture, to present the peculiar copper colour characteristic of the cyano-nitride of titanium. An analysis of this product was found to present certain difficulties, and has not been completed.

The electrical energy consumed during the test amounted to 104 kilowatt hours, apart from generator and transformer losses, which is equal to 3.4 K. W. hours per pound, or 1.17 h. p. years per long ton of iron.

A rough balance sheet shows that the titania, alumina and silica in the charge are satisfactorily accounted for in the product obtained; the lime in the slag is, however, far less than in the limestone and ore charged, so that it is clear that there was a large excess of lime which remained in the unfused residue. There is also a loss of about one-third of the iron, which may be partly by volatilization and partly by filtration into the furnace bottom. The excess of charcoal left in the furnace shows that the bare amount calculated (21.4 lbs.) would have been ample without any allowance for mechanical losses.

The unsatisfactory results obtained in this test threw doubt on the principles laid down by Rossi and it was decided to investigate the fusibility of titaniferous slags.

Fusibility Tests

These were made to ascertain the fusibility of mixtures of silica, alumina, lime and titania in varying proportions. Alumina in slags does not vary much and is frequently about ten per cent so it was

decided to simplify the investigation by keeping the alumina constant at ten per cent and varying the silica, lime and titania. The method adopted was that of making small test cones of the various mixtures and determining the temperature at which each cone bent over when heated in a furnace.

The materials from which the cones were made were as pure as could be obtained. The silica was prepared by crushing quartz until it would pass through a sieve of 100 meshes to the linear inch, and washing with hot acids until it was free from soluble matter. Alumina was made by adding ammonia to a solution of aluminium sulphate, washing the precipitate and igniting it in a muffle at a bright red heat. Titanium oxide was obtained as the chemically pure reagent, and was tested, with negative results, for all the common impurities. Lime was prepared by heating chemically pure calcium oxalate in a muffle until it was free from volatile matter. All materials were tested for purity and were kept under such conditions that neither moisture nor carbon dioxide could be absorbed.

The ingredients were weighed out, in the different proportions, so that the mixture in each case amounted to five grams; an amount which was sufficient for two cones. The materials were ground together in an agate mortar, while dry, until thoroughly mixed, and then moistened with water to a stiff paste. It was found that mixtures containing 30% or more of lime could not be moulded directly into cones, as they would crack and fall to pieces after drying; owing no doubt to the absorption of carbon dioxide by the lime. To prevent this trouble the moistened mixtures were placed on glass plates and were allowed to dry in the air for several days. They were then re-ground, moistened and moulded into cones.

The "cones" are three-sided pyramids, like the well known Seger cones, and were formed without difficulty in a mould made by cutting a V-shaped groove in a block of wood. The wooden mould was coated with melted paraffin and was lightly oiled with a cloth before each cone was made. The paste was pressed into the groove, smoothed off with a spatula, and pushed out by using the bottom of a Seger cone. The cones were then allowed to dry in the air or in an oven.

The melting point tests were made in an alundum muffle heated by a Meker gas burner; but for temperatures above 1,500°C an electrically heated carborundum muffle was employed.

The temperature measurements were made with a platinum, platinum-rhodium thermocouple and also with Seger cones. For experiments of this kind the Seger cone indications are accepted as being more satisfactory than the actual temperature readings as shown by the thermo-couple, and the results reported in this paper are based

on the former indications. In all the experiments the temperature of the muffle was raised about 120°C per hour, and under these conditions the temperature at which each Seger cone melted, as shown by the thermo-couple, was about 80°C above its rated melting temperature. For the tests in the electric muffle the thermo-couple could not be used and Seger cones alone were employed. The temperature readings made in the gas muffle, below $1,500^{\circ}\text{C}$, may be accepted as reasonably accurate; above $1,500^{\circ}\text{C}$ the temperature readings are only approximate.

Some difficulty was experienced in finding a suitable base to support the cones in the furnace. It was found that some of the cones would flux with fire clay or alundum so that when supported on these materials the cones melted at the base and fell over before their melting temperature was reached. Carbon plates could not be used as they burned away before the tests were completed. Satisfactory results were obtained by the use of cone-holders, made of platinum foil, placed on an alundum plate.

The results of the fusibility tests have been plotted in Figure 2, in which shaded circles are employed to show relative fusibility. It will be noted that fusible slags can be obtained with as much as 70% of titania, providing the lime is kept low. There is a large area of fusible slags in the middle of the diagram; these slags containing about equal proportions of lime, silica and titania, and most of the mixtures having 10% of lime are fusible. Two isolated areas of high melting point mixtures occur on the line of 20% lime; corresponding, no doubt, to some chemical compounds. In general the least fusible mixtures are those containing much lime and little silica.

Second Smelting Experiment. April 25th, 1916

This was made in the same furnace and under the same conditions as the first, except that the charge was calculated so as to yield a fusible slag, and the amount of charcoal was reduced. An examination of Figure 2 shows that a slag having the composition: 25% TiO_2 , 30% CaO , 35% SiO_2 , 10% Al_2O_3 would be readily fusible, and the charge was calculated as follows:

	100 lbs. ore	To enter pig	Left for slag	Intended slag	To be added
Fe.....	49.9 lbs.	49 lbs.			
SiO ₂	1.8 "	1 "	0.8 lbs.	14 lbs.	13.2 lbs.
TiO ₂	10.8 "	0.8 "	10.0 "	10 "	0 "
CaO.....	5.5 "		5.5 "	12 "	6.5 "
Al ₂ O ₃	4.0 "		4.0 "	4 "	0 "
		50.8 "	20.3 "	40 "	19.7 "

The additions consisted of 13.2 lbs. of siliceous sand and 12.2 lbs. of limestone.

The charcoal used in the last experiment, per 100 lbs. of ore, was 25.75 lbs; and 4.7 lbs. (per 100 lbs. of ore) remained in the furnace. The net amount used, 21.0 lbs. was therefore intended for this run, but only 20.5 lbs. was actually charged. The fine material was agglomerated with water and 7 lbs. of water glass; a larger amount being needed for this charge.

The smelting operation was carried out satisfactorily and the slag and metal were tapped out three times during the run which lasted three hours; the slag was quite fluid.

The products were:

Pig iron.....	39.5 lbs.
Slag.....	47.0 lbs.
Unfused residue.....	4.0 lbs.
Unused charcoal.....	1.0 lbs.

The iron, which was white in fracture, was analysed with the following results:

	<i>Tap No. 1</i>	<i>Tap No. 2</i>	<i>Tap No. 3</i>
Silicon.....	0.08%	0.21%	0.26%
Titanium.....	0.02%	0.04%	0.05%
Carbon.....	1.85%	1.92%	2.08%

The slag was black, glassy, and vesicular; an average sample contained:

Titania.....	20.05%
Silica.....	29.40%
Alumina.....	8.11%
Lime.....	18.12%
Magnesia.....	2.14%
Ferrous oxide.....	22.31%
	<u>100.13%</u>

It will be noticed that the reduction of the iron is very incomplete and the pig iron not fully carburized. This is largely because, in this small furnace, the ore enters the zone of fusion with scarcely any opportunity for preliminary reduction, such as takes place in the upper part of a blast furnace. This condition is aggravated by the reduction in the proportion of charcoal, by the great fusibility of the slag, and by the arrangement of the electrodes which caused the slag to boil up and nearly fill the furnace with melted and half reduced ore. It will be desirable to repeat the work under conditions more favourable for the reduction of the iron in the ore.

Balance sheet of the Smelting operation

	<i>Materials charged (pounds)</i>				<i>Products (pounds)</i>		
	<i>Ore</i>	<i>Limestone</i>	<i>Silica</i>	<i>Total</i>	<i>Pig Iron</i>	<i>Slag</i>	<i>Total</i>
Fe.....	49.9			49.9	39.0	8.2	47.2
SiO ₂	1.8	0.3	13.0	15.1	0.1	13.8	13.9
TiO ₂	10.8			10.8	0.0	9.4	9.4
CaO.....	5.5	6.6		12.1		8.5	8.5
Al ₂ O ₃	4.0	0.2		4.2		3.8	3.8
				92.1			82.8

The smelting operation lasted three hours with an average power of 27.3 K.W.; using about 300 amperes per electrode at about forty-five volts. The consumption of electrical energy was 2.07 K.W. hours per pound, or 0.71 H. P. years per long ton of the pig iron.

Conclusions¹

1. In view of the deficiency of good iron ores in Canada, it is desirable to investigate the large deposits of titaniferous magnetites with a view to their use in the production of iron or steel.

2. It is admitted that the iron produced from such ores is of very good quality, but there is much doubt with regard to the commercial possibility of smelting titaniferous ores and of the kind of fluxes to be used.

¹ A fuller discussion of some of these conclusions is contained in a paper by Dr. A. Stansfield which forms part of a report by Mr. J. A. Dresser on the Geology of the St. Charles district on the Saguenay. Geological Survey, Ottawa, 1916.

3. It has been shown in this paper, by reference to older work and by direct experiment, that titaniferous ores can be smelted without special difficulty provided that silica as well as limestone is used as a flux; but that it is only practicable to make a white or low silicon iron from an ore containing more than about one per cent of titanium.

4. A provisional chart of melting points of titaniferous slags has been prepared. This chart will prove of value in making up charges for smelting such ores.

5. Titaniferous ores will in general be enriched before smelting by magnetic concentration, but this only removes a part of the titanium.

6. In view of the somewhat low percentage of iron in these ores, of the large amount of flux that may be required, and of the limitation to the production of low silicon pig iron, it is unlikely that these ores will be smelted on a large scale in competition with the richer imported hematites. The iron produced is, however, of a specially good quality, and as the ores are frequently particularly low in phosphorus and sulphur, they can be used to advantage either as an addition to an ordinary furnace charge with the object of improving the quality of the iron, or for the whole charge of a charcoal blast furnace, or an electric furnace, for the production of special qualities of charcoal iron commanding a high price.

Bibliography

A recent bibliography on this subject is given by Bradley Stoughton, Trans. Can. Mining Inst. Vol. XVIII, 1915, who has reviewed the previous work referred to in the present paper, and arrived at similar conclusions with regard to the fusibility of titaniferous slags and the limits within which such ores can be used. Mr. Stoughton did not make any experiments on the melting points of slags or the smelting of the ores.

The more important references (arranged chronologically) are as follows:

RILEY, E.

Journ., Chem. Soc. Vol. XVI, 1863, p. 387.

FORBES, D.

Chemical News, Dec. 11, 1868.

BOWRON, W. M.

"The practical metallurgy of titaniferous ores," Trans. Amer. Inst. Mining Engs. Vol. XI, 1882, p. 159.

ROSSI, A. J.

Journ. Amer. Chem. Soc. Vol. XII, 1890, p. 91.

Trans. Amer. Inst. Mining Engs., Vol. XXI, 1893, p. 832.

Trans. Amer. Inst. Mining Engs., Vol. XXXIII, 1903, p. 179.

LODYGUINE, A.

"Some results of experiments with the reduction of titaniferous ores."
Trans. Amer. Electrochem. Soc. Vol. VII, 1905, p. 157.

EVANS, J. W.

Journ. Can. Min. Inst. Vol. IX, 1906, p. 128.

HAANEL, EUGENE.

"Experiments made at Sault Ste. Marie, Ont., under Government auspices,
in the smelting of Canadian iron ores by the electro-thermic process."
Ottawa, 1907.

GIN, GUSTAVE.

"The electrical reduction of titaniferous ores."
Trans. Amer. Electrochem. Soc. Vol. XI, 1907, p. 291.

STANSFIELD, ALFRED.

"Tool steel direct from the ore in an electric furnace," Journ. Can. Mining
Inst. Vol. XIII, 1910, p. 151.

EVANS, J. W.

Journ. Can. Mining Inst. Vol. XV, 1912, p. 123.

SINGEWALD, JOSEPH T., Jr.

"The titaniferous iron ores in the United States, their composition and
economic value." Bull. 64, Bureau of Mines, Washington, 1913.

STANSFIELD, ALFRED.

"The Electric Furnace," 1914, p. 256.

CONE, EDWIN F.

"Titanium ores in the blast furnace." Iron Age, Oct. 22, 1914, p. 936.

BACHMAN, FRANK E.

"The use of titaniferous ore in the blast furnace." Year book, Amer.
Iron and Steel Inst., 1914.

STOUGHTON, BRADLEY.

"The smelting of titaniferous iron ores," Trans. Can. Mining Inst. Vol.
XVIII, 1915, p. 140.

DULIEUX, R. E.

"Les minerais de fer de la Province de Québec, gisements et utilisation."
Department of Mines, Quebec, 1915.

STANSFIELD, ALFRED.

"Electric smelting as a means of utilizing the ore of the St. Charles deposit."
This is part of a report by John A. Dresser on the geology of the St. Charles
district. Geological Survey, Ottawa, 1916.

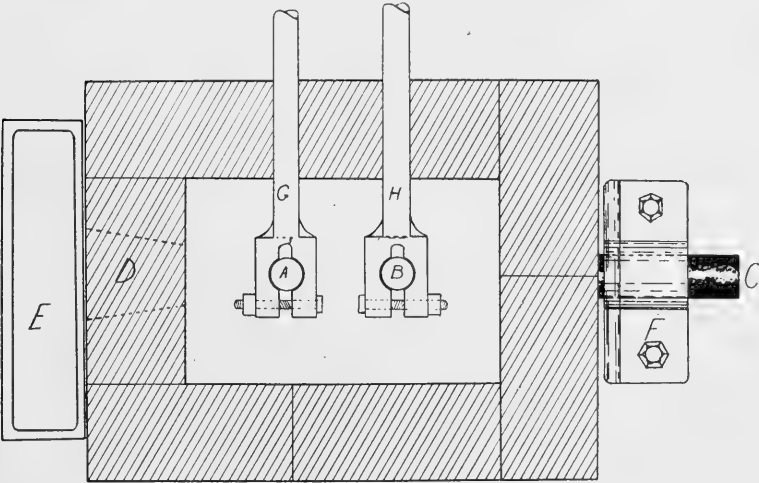
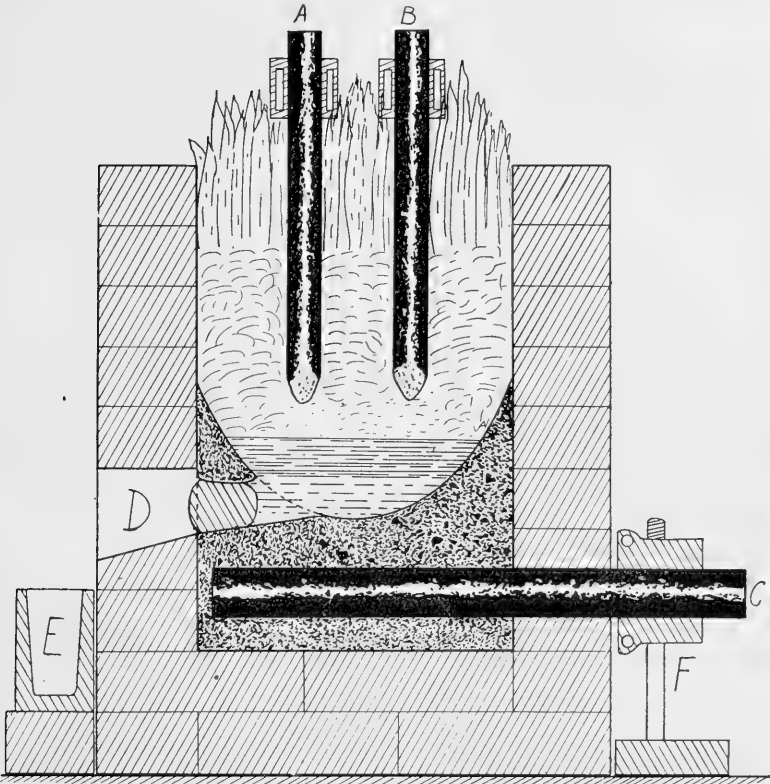


Fig. 1. Electric Smelting Furnace.





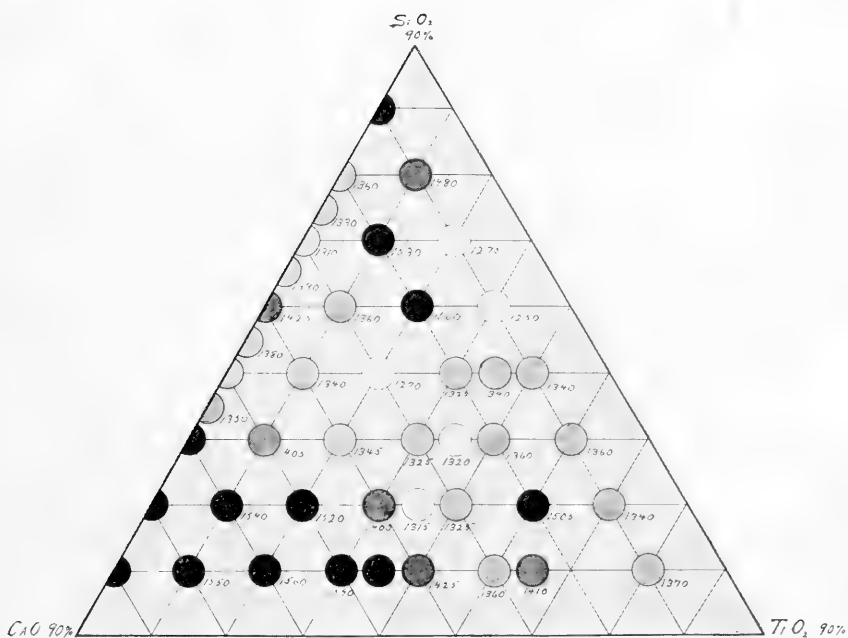


Fig. 2. Softening temperatures of mixtures of Silica, Lime, Titania, with 10% alumina.

Transactions of the Royal Society of Canada

SECTION III

SERIES III

SEPTEMBER 1916

VOL. X

The Structure of Hailstones of Exceptional Form and Size

By FRANCIS E. LLOYD, F.R.S.C.

Presented by PROFESSOR C. H. McLEOD, F.R.S.C.

(Read May Meeting, 1916)

At 8.45 p.m. on January 9, 1916, at Carmel, California, there occurred a violent hail-storm of short duration. The precipitation consisted of hail ranging in size from the usual small opaque, or partly opaque, pellets to lenticular masses between two and three cm. in diameter, with radiating arms adding variously to the total dimensions. At the close of the squall the ground was covered by hailstones of most bizarre shapes, and the writer at once made a record, so far as circumstances allowed, of some of the most characteristic and significant. As the temperature was not very low the hail melted rather rapidly. It was possible, however, to make the following observations. The sketches were made hurriedly under some difficulties, and are herewith reproduced with no alteration or embellishment. The internal structure could be clearly seen, that of the hailstone shown in figure 6 being especially clear and convincing.

1. The chief mass of the hailstone was lenticular, roughly plano-convex (figures 6 and 8). This form was easily seen to be general for all the larger hailstones.

2. The chief mass had been built up about a roughly spherical nucleus which was usually opaque (figures 3, 4, 6, 9) due to included air, or less frequently clear (figure 11). This fact accords with previous observations.

3. Surrounding the nucleus there was a region in which zonation was evident. The zonation was prolate-spheroidal in the sense of the chief mass (figure 9). Small vesicles were abundant. Large ones were not infrequent and when present were always crescentic and disposed in such a manner as to show clearly that their shape was determined by the same conditions as determined also the shape of the

whole chief mass. The lenticular shape was therefore original and not due to melting conditions.

The zonation ceased in its outer layers to be concentric and became radiate. The consequent radiate structure was connected with the further and most striking feature presented by the hailstones under discussion, namely, that:

4. From the chief mass there extended a number of radiating arms like the spokes of a wheel (figures 4, 6, 8). Regarding these as primary, there might also be a number of secondary arms, or better, *mammillae*.

The structure of the radiating arms was perfectly apparent in the case represented by figure 6, which was studied as carefully as possible under strong transmitted light. Briefly stated, the structure recalled that of an icicle. A central core of vesicular ice connecting with, and constituting the radiating arms of, the zonate interior of the chief mass, could be clearly seen extending to, or near to, the apex of each arm (figure 6, a-c). The total structure was of cone-in-cone, roughly symmetrical with reference to the axis.

When only two arms were present the whole hailstone might have the form of a spindle with a spheroidal mass at the middle. A superficially similar case is recorded to have fallen at Bonn in 1822. The figure¹ shows that the arms had a transverse zonation and appear to have been merely the unmelted parts of an original sphere with marked concentric zonation. Hailstones with long projecting crystals were seen in the Caucasus by Moritz of the Tiflis Observatory² on May 27, 1869. The figure leads us to believe that the projections were in no orderly disposition, as occurred in those which we are here describing.³ The remarkable radiating crystalline structure of the spherical hailstones which fell in N. W. France, July 4, 1819⁴ is also evidently distinct. In none of the hailstones which the writer examined was there the slightest suggestion of such origin. The ends in many cases were more or less obliquely truncated, but this was due to breakage. A broken off section of a large arm (figure 12) was found, confirming this opinion.

5. The secondary projections, or *mammillae*, were always on the convex, and not on the plane, face of the lenticular chief mass (figure 8). They recalled drops of water hanging from the surface of a sheet of glass. In one instance (figure 2) there appeared to be a

¹ The Century Dictionary.

² Greely, A. W., *American Weather*, N. Y., 1888, p. 78.

³ Loomis in his *Treatise in Meteorology*, (1872), refers radiating protuberances in general to projecting ice-crystals.

⁴ Greely, *l.c.*

secondary set of arms disposed in a plane normal to a plane in which an original set of arms had been formed and melted away or broken off. In other instances an almost botryoidal form had been assumed (figures 3, 7), but no suggestions of growth by aggregation, (and such is known to occur) could in any case be seen. One instance (figure 10) was difficult to understand, but most likely was a remainder after melting.

The following explanation of the origin of the monoplanal radiate structure as above described is offered.

The hailstone is built up on an original spheroidal or top-shaped nucleus.

As a result of rotation in one plane the chief mass is built on the equatorial zones. The rate of rotation is sufficient to allow the arms to be built up stalactite-fashion, but is not rapid enough to throw off the water. The water tends to collect also in the under face of the lens and, by freezing, forms mammillae. Alteration of the plane of rotation may occur more easily when the rate of rotation is slow, and a second set, or additional sets, of radiating arms may result. This explanation assumes the conditions such as alternate freezing and thawing, sustained flight, and the like, which need not be discussed here.

The evidence seems conclusive that the arms are not derived from large projecting crystals, as Loomis (*l.c.*) has stated; nor is the botryoidal appearance due to the coalescence of originally separate hail.

A severe hail storm occurred also on the evening (at 7.30) of January 28, 1916. The hailstones were (*a*) single and top-shaped, due to the lower surface growing more rapidly than the upper.¹ The upper end is always loose and spongy in texture and roughly concave. Or (*b*) compound, due to the coalescence of separate top-shaped hail. It is worthy of note that in most instances the component members were frozen together side by side, to form a saucer-like mass, the axes of the component hail converging above (figure 13).

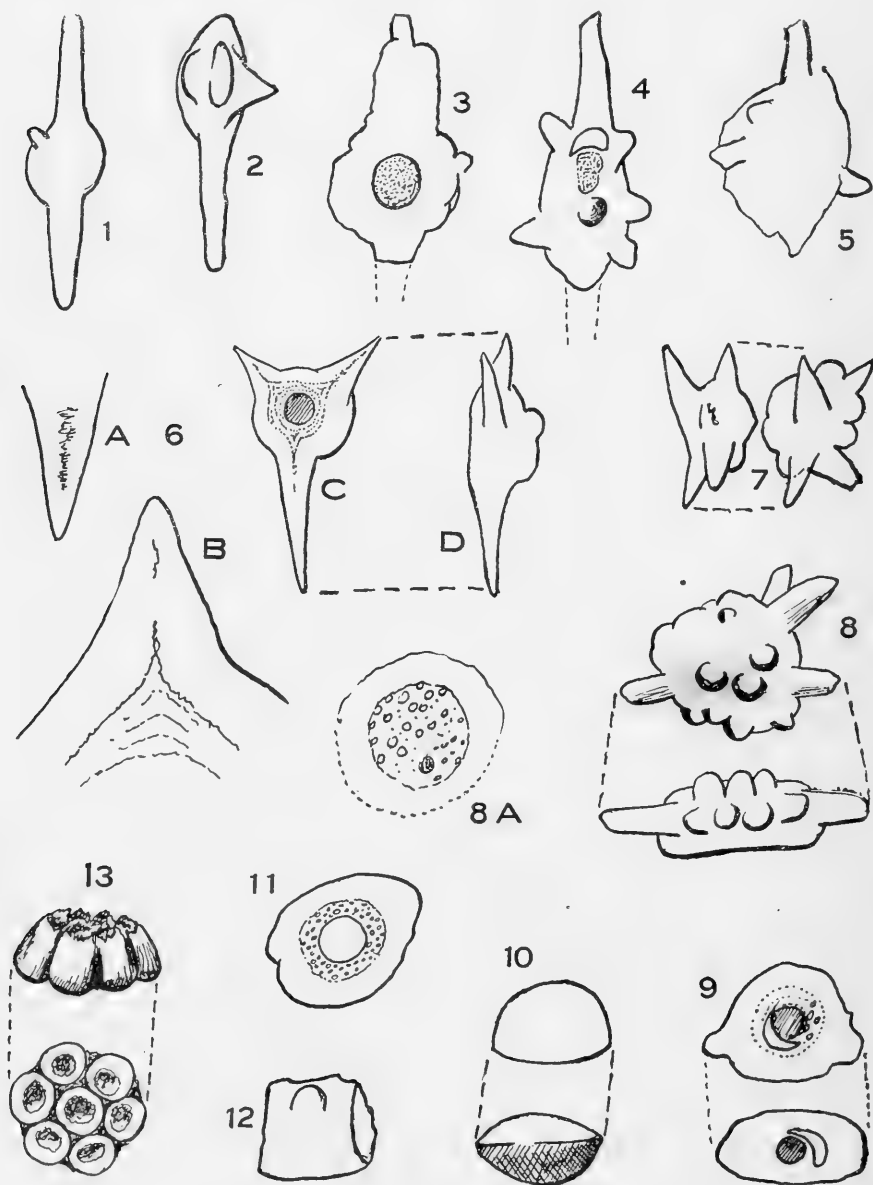
The writer would offer the following suggestion for the further study and recording of the form of hailstones, in view of their evanescent character and the suddenness and brevity of the opportunities.

It should be quite easy to make moulds of hailstones by means of plasticine by pressing two blocks of suitable size against a hailstone

¹ Russell, R. Hail. London, 1893.

rapidly and firmly. One could then at his leisure pare off the block, pour out the water and make a cast.

In regions—such as certain points in the Pacific Coast in winter—where hailstorms frequently occur this method would be certain to afford results.



Comparison of the Callendar Sunshine Recorder and the Angstrom Pyrheliometer

By JOHN PATTERSON, M.A., (Cantab).

Presented by Sir R. F. STUPART, F.R.S.C.

(Read May Meeting, 1916)

In the summer of 1911 the author¹ made a comparison of the Angstrom pyrheliometer and the Callendar sunshine recorder by giving them a similar exposure. In this comparison it was shown that the difference between the two instruments varied with the time of day: that the greatest excess of the Angstrom over the Callendar occurred between 9 a.m. and 10 a.m. (Kimball² obtained a similar result but found that, by orientating the sunshine receiver 90°, the greatest excess occurred in the afternoon) and that from 1 p.m. to 3 p.m. the percentage difference between the two instruments did not change appreciably. It was further shown that, if the Angstrom instrument were shielded with glass of the same kind as in the bulb of the Callendar sunshine recorder, the intensity of the radiation was diminished considerably. In an endeavour to find out the source of the difference between the two instruments they were compared in the same way as before with a second Angstrom pyrheliometer protected with glass of the same kind as in the sunshine receiver. The Callendar sunshine recorder was mounted as before in a tube about 18 inches long and attached to an equatorial telescope so that the surface of the receiver was always exposed perpendicular to the sun's rays.

The instruments were all mounted ready for comparison in June, 1912, but before a clear day was obtained thick haze set in, and did not entirely disappear before May, 1913. Observations were taken on several days in March and April, 1913, but they were not satisfactory because the haze was crossing the surface of the sun and the variations were so great that the curves of radiation could not be compared. On April 29th, 1913, however, the haze did not show rapid fluctuations and observations were taken from 9 a.m. to sunset. The results are given in the following table and are plotted in fig. 1.

¹ Meteorological Service of Canada, M.S. 50.

² U. S. Monthly Weather Review, Aug., 1914, p. 474.

TABLE

April 29th, 1913

<i>Time</i> (<i>Local Apparent</i>)		<i>A</i>	<i>B</i>	<i>C</i>
<i>h.</i>	<i>m.</i>			
9	18 a.m.	1.170		.996
9	19		1.011	
9	51	1.218		1.052
9	55		1.061	
10	22	1.244		1.091
10	25		1.066	
11	12	1.256		1.130
11	15		1.079	
11	42	1.251		1.154
11	45		1.080	
12	08 p.m.	1.239		1.160
12	09		1.057	
12	35	1.264		1.170
12	41		1.050	
1	07	1.256		1.144
1	14		1.035	
2	00	1.217		1.106
2	05		.974	
2	34	1.152		1.038
2	39		.952	
3	08	1.126		1.002
3	14		.906	
3	46	1.061		.974
3	52		.889	
4	32	.923		.852
4	35		.776	
4	58	.840		—
5	02		.750	
5	05	.812		
5	09		.725	.772
5	30	.684		
5	33		.579	.696
5	42	.602		
5	45		.563	.638
5	59	.518		

<i>Time</i> (<i>Local Apparent</i>)	<i>A</i>	<i>B</i>	<i>C</i>
<i>h. m.</i>			
6 02		.436	.537
6 14	.390		
6 18		.341	.447
6 25	.307		
6 29		.255	.363
6 37		.192	.288
6 43	.154		
6 46		.113	

A = Sun's radiation in gramme-calories per sq. cm. per min. as given by Angstrom's pyrheliometer No. 78.

B = The same with No. 147 shielded with glass.

C = The same as given by the Callendar sunshine recorder.

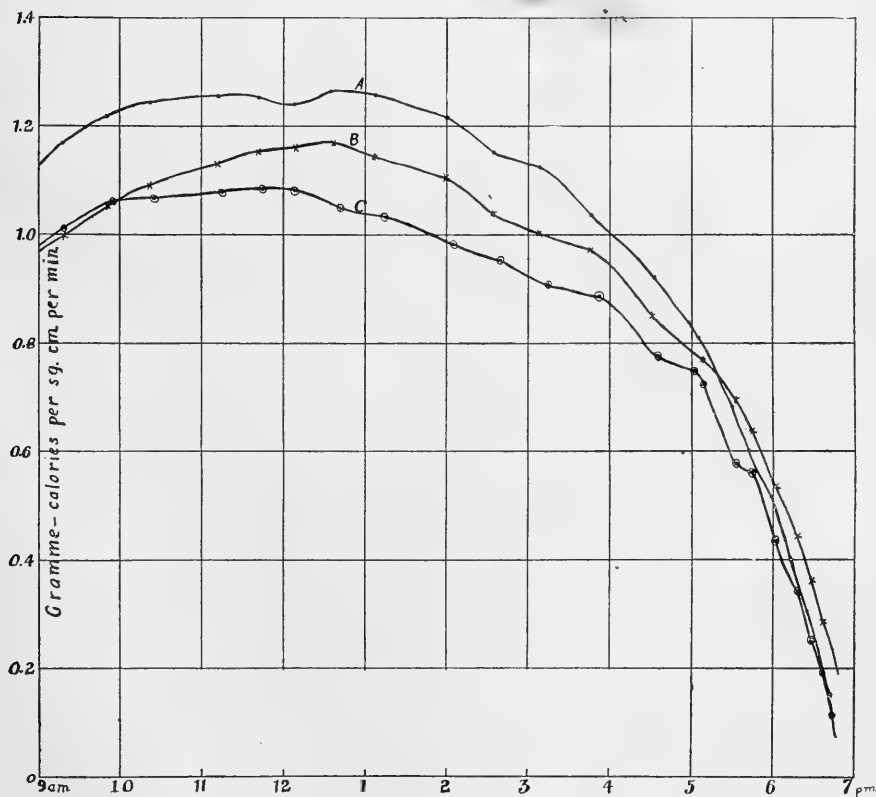


Fig. 1

A previous comparison of the two Angstrom instruments showed that No. 147 was 0.4% higher than No. 78. The latter instrument was used as the standard and the readings of the former were expressed in terms of the standard by multiplying them by .996. The curves for Angstrom No. 78 and the Callendar are similar to those obtained in the first comparison but the curve for No. 147 when covered with glass agrees fairly well with the Callendar in the morning, but as the day advances the Callendar readings become greater and continue so for the rest of the day. This result was obtained on all days on which comparisons were made. Taking the percentage difference from the standard it shows that during the greater part of the day the pyrhelimeter covered with glass bears about the same ratio to the standard but that as the sun gets near the horizon the readings increase relatively to the standard or the glass absorbs less and less of the sun's radiation.

The comparison further showed that by covering the Angstrom instrument with glass its readings were then less than the Callendar. This result indicated the desirability of comparing the Angstrom with the Callendar when the glass bulb protecting the bright and black platinum resistances was removed, and an old sunshine receiver was obtained from the Cambridge Scientific Instrument Co. In this receiver the platinum thermometers are mounted on a circular disk of mica, 2 inches in diameter, one half being black and the other bright, (the protecting bulb was not exhausted) while in the other type they are mounted in checker board fashion on a square disk of mica. This receiver was not standardized when received and it was necessary therefore, to standardize it before removing the glass bulb. The receiver was mounted as before in a tube about 18" long, the surface of the receiver being exposed perpendicular to the sun's rays. Its readings on the Callendar recorder with the standard charts were taken at regular intervals at the same time as an observation was taken with the Angstrom pyrhelimeter and the amount of heat received from the sun as determined by the Angstrom instrument was divided by the reading of the Callendar; in this way the value of a scale division on the Callendar was obtained in terms of the Angstrom and it was found to be .0444 gramme calories per sq. cm. per min. Having determined the scale value with the glass bulb surrounding the receiving plate, the next operation was to determine it with the glass bulb removed but in attempting to cut away the glass bulb just below the mica disk, the bulb and one of the wires were broken and then the disk was mounted on an ebonite base, the disk being about 3" from the base. In this case the value of a scale division was found to be .0420 gramme calories per min. The receiver was next

mounted in a wooden box of large cross section but of the same length as the tube and protected from radiation from the sides by a series of dead black diaphragms: the value of a scale division was then found to be $\cdot 0417$ grammé calories per min. or practically the same as before. The results show that the Callendar receiver when unprotected by glass is about 6% more sensitive than when screened by the glass globe. Kimball (loc. cit) found in one experiment that the unprotected receiver was about 10% more sensitive than when protected by the glass envelope. Even applying this correction the readings given by the Callendar sunshine recorder are still much below those given by the Angstrom Pyrheliometer except when the radiation is weak. Miller¹ has shown that when the sunshine receiver is exposed in its normal position (disk horizontal) that the caustic formed in the bulb by reflection affects the readings by making them too high when the reflected part falls on the black surface and too low when on the bright. As the receiving disk was perpendicular to the sun's rays, in the observations described in this paper, this source of error was eliminated.

In the Callendar sunshine recorder, the radiation is measured by the difference in temperature between black and bright surfaces; the black surface consists of platinum wires covered with a black enamel and the bright surface the bright platinum wires, but as these wires are in contact with the mica disk on which they are wound the bright surface is in reality that of the mica. The various comparisons that have been made of the Callendar sunshine recorder show the desirability of making an attempt to get its readings more nearly absolute by laboratory investigation.

¹ U. S. Monthly Weather Review, June, 1915, p. 264.



On the Release of Radium Emanation from Water at Different Temperatures by the Bubbling Method.

By J. MORAN, M.Sc.

Presented by PROF. A. S. EVE, D.Sc., F.R.S.C.

(Read May Meeting, 1916)

Introduction

Two methods are in use for the determination of the amount of radium in a radium solution by the emanation method—

(a). Expel all the emanation from the solution by boiling, seal up the flask in an air-tight condition and allow to stand for a definite interval, say a week or more, and then drive off the accumulated emanation by boiling, collecting the emanation over water in a collecting-apparatus. The fraction of the total emanation accumulated in the interval is obtained from Rutherford's tables on the growth of emanation. The emanation is passed into the electroscope, and tested in the usual way, by the rate of fall of the gold-leaf.

or, (b). Take the cold solution, bubble air through it until the emanation is expelled as far as bubbling will expel it, then bubble air through the solution at a constant rate, passing it into and out of an ionisation chamber connected with an electroscope.

Wright and Smith, in the *Philippine Journal of Science* for Feb., 1915, published results of an investigation of the question:

"Is the standard solution put into the so-called steady state by bubbling air through the solution for a period of from two to three hours, or is it necessary to boil the solution? If the bubbling of air through the cold solution does not take out the emanation as fast as it is formed what per cent is taken out by the process?"

They claimed to have shown that considerably more emanation is obtained by bubbling air through the boiling solution than through a cold one. It would appear from their results that radium emanation distributes itself in definite proportions between the water and the air-space above it in the case of a radium solution in a vessel, and that more of the emanation is removed as the temperature rises, reaching a maximum at boiling temperature.

Object. The object of this experiment was to investigate the release of radium emanation from water at different temperatures by

bubbling air through the solution at a uniform rate. In this way it was hoped to be able to obtain some curve which would show how the release of emanation varied with the temperature, and by means of determinations at definite temperatures between room temperature and the temperature of boiling water, to interpolate for intermediate temperatures. At 100° C. Boltwood has shown that all the emanation can be expelled.

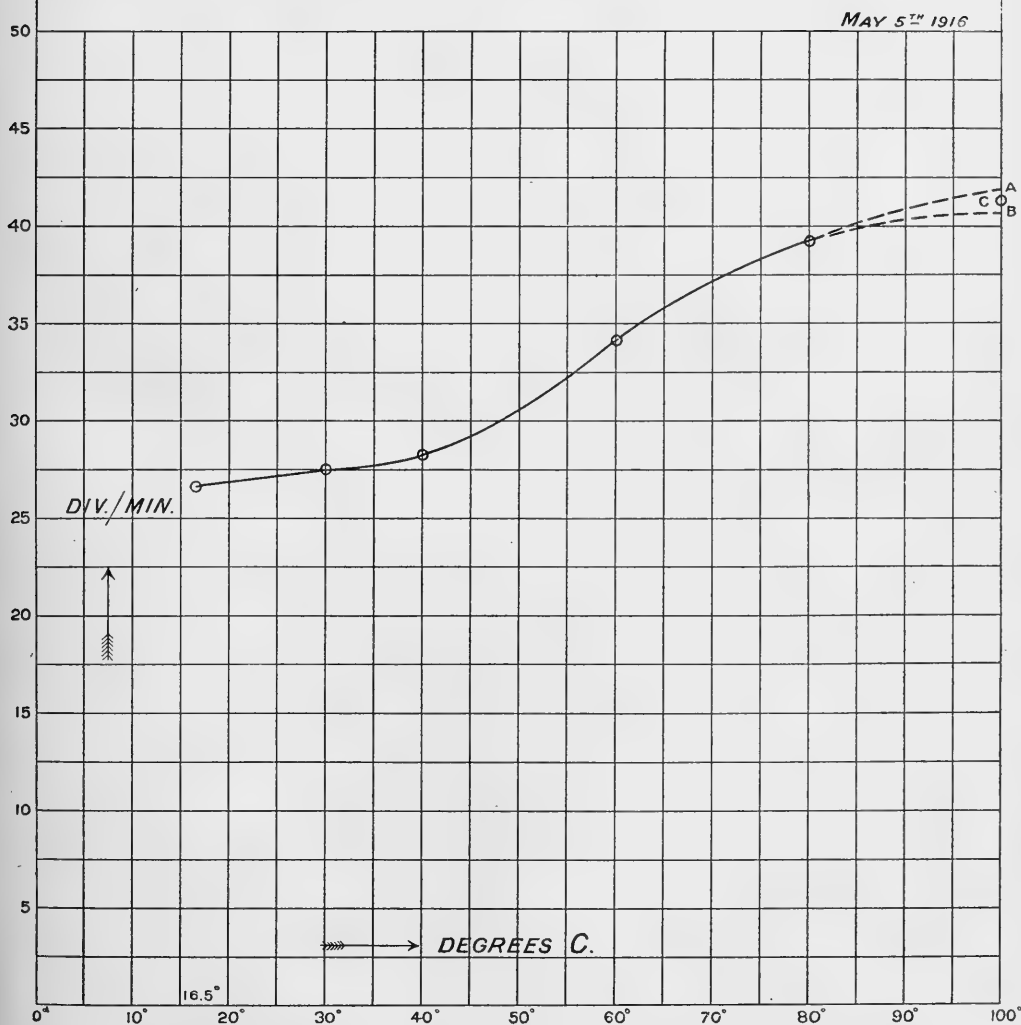
Apparatus. The following apparatus was necessary—

- (a). An electroscope and ionisation-chamber combined.
- (b). A gasometer.
- (c). A motor-pump.
- (d). Drying-bottles.
- (e). A radium solution of suitable strength, with a two-hole rubber stopper for bubbling air through.
- (f). A microscope.
- (g). A chronometer.
- (h). A thermometer.
- (i). A thermostat.

(a). The ionisation-chamber was made of sheet-tin, cylindrical in shape, 15 cms. in diameter and 26 cms. high. There was one small circular hole in the top, through which a copper rod was fixed in position by means of sulphur insulation in a vulcanite collar. The copper rod extended down to the inlet and 3 or 4 cms. above the top for the purpose of attaching the gold-leaf. Another sheet-tin vessel was then sealed down over the top of the ionisation-chamber, forming the electroscope proper. It was 9 x 8 x 12 cms., provided with two mica windows for observation of the movement of the gold-leaf, and a small circular opening in the top through which a charging-key was passed, being fixed in position and insulated by sulphur and vulcanite.

(b). The gasometer. The diameter of the inner cylinder was 56 cms. and the available length 90 cms. A steel band passing over a pulley served to balance it in position, and heavy weights placed on the top of it furnished the necessary air-pressure. Through one of the stop-cocks on the top of the cylinder the air was forced into it, and it was then allowed to pass out through another. Rubber and glass tubing were connected to this stop-cock, and the current of air passed first into two bottles containing sulphuric acid. It was then bubbled through the radium solution, next through another sulphuric acid bottle, and finally into and out of the ionisation-chamber. The sulphuric acid bottles were for the purpose of removing the moisture from the air, which had been in contact with the water, both in the gasometer and in the flask containing the radium solution.

I.
GRAPH
SHOWING RELEASE OF RADIUM
EMANATION FROM WATER AT
DIFFERENT TEMPERATURES
BY BUBBLING



(c). The motor-pump supplied worked perfectly. The pumping-connections were attached to the second stop-cock on the top of the gasometer, and the electrical connection made with the switch-board. It was not necessary to use it continuously, as it was found possible to obtain the most uniform pressure by maintaining the gasometer working with a maximum raise of the cylinder equal to about two feet. If raised much farther the inner cylinder came into contact with the outside one through not being quite evenly balanced, and altered the regular flow of air. The air-current was regulated by pinch-cocks on the rubber-tubing connections.

(d). The drying-bottles contained C.P. H_2SO_4 , and arrangements for bubbling the air, or air and emanation, through it.

(e). The radium solution used contained 1.57×10^{-7} grams of radium. It was fitted with a two-hole rubber stopper through which passed two lengths of glass tubing, one passing almost to the bottom of the solution so that the air could be bubbled through it, while the other extended only to the bottom of the rubber stopper. The stopper was sealed down with vacuum wax and wired.

(f). The microscope was newly-cleaned and showed a good clear scale. It was focussed on the gold-leaf at the beginning of the experiment, and then fixed in position with paraffin.

(g). The chronometer used was a new one and regulated. It was further checked for half-minute intervals with the second-hand of the clock in the Elementary Laboratory in the Physics Building, and showed absolute agreement for half-a-dozen consecutive instances.

(h). The thermometer used read to about 130°C .

(i). The thermostat consisted of a large glass beaker two-thirds full of water. The temperature was maintained constant by means of a thermo-regulator. This consisted of a large glass tube 3 mms. in diameter in the stem, and a large cylindrical bulb at the end about 3.8 cms. diameter. The greater part of the bulb was filled with toluol, and the remaining portion as well as the greater part of the stem, with mercury. Toluol is used in the bulb because its coefficient of expansion is much greater than mercury, and makes it more sensitive. A separate part, consisting of a vertical tube and two side branches, is fitted into the stem of the thermo-regulator with a rubber stopper. The quantity of mercury in the stem must be so adjusted that the lower part of this separable piece just touches the surface of the mercury at the temperature of the experiment. The working-principle of the thermo-regulator then follows:

Connect up the gas for heating the flask with the separable part of the thermo-regulator. It divides itself so that one portion passes down the vertical tube and out to the bunsen through the side-tube

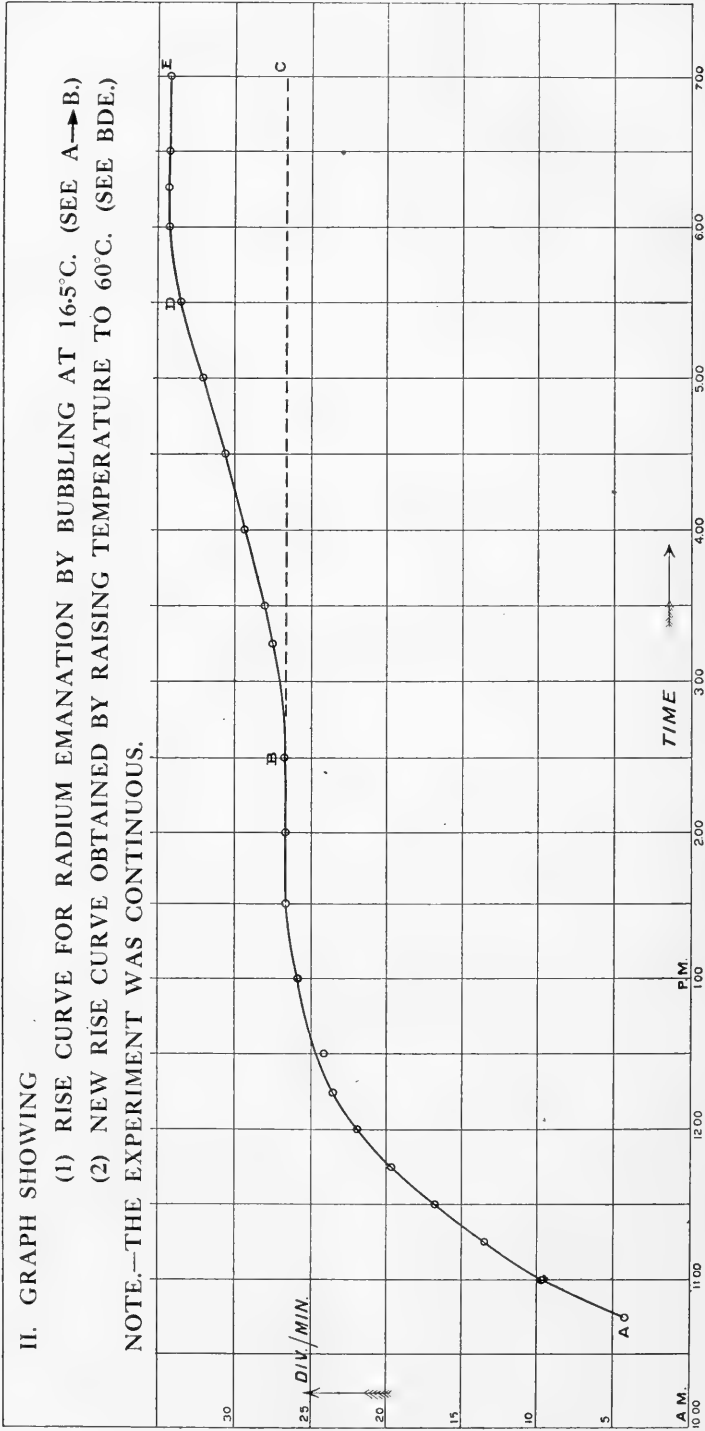
unless prevented by the mercury. In that case, there is only one source of supply of gas left, viz., that through the branch tube, and this can be regulated by a pinch-cock. If the bath cools, the mercury falls, the supply of gas is increased, and hence the bath is raised in temperature and the mercury rises and shuts off the gas at the proper temperature.

Procedure. The gasometer was first rinsed out several times with air before starting the experiment. Water was previously poured into the main cylinder in sufficient quantity to seal the open end of the open cylinder. Air was then pumped into the gasometer by the motor-pump to a height of about two feet, over which drop of the cylinder the pressure could be uniformly regulated. The experiment was started with a current of air equal to three bubbles per second, and with the temperature at 16.5°C . Readings were taken every few minutes, and the growth of the ionisation current traced. The maximum was reached in about three hours, and at the end of this period about twenty consecutive readings failed to show any variation exceeding about one-half of one percent. A graph accompanies this paper showing the rise curve for 16.5°C . The temperature of the bath was now raised to 60°C . as quickly as possible. It was found that the rate of discharge of the gold-leaf increased as the temperature was raised. Another curve was obtained similar to the first one, which also reached a maximum at the end of three hours. Fig. II shows the change observed.

The next step in the investigation was to heat up the bath to 80°C . before bubbling, trace the changes in the rise curve for this temperature, and see if the maximum ionisation exceeded that for 60°C . This was exactly what happened. The maximum reached was found to be proportionately greater by an amount which can be determined from the curve submitted.

The warm water was then quickly siphoned off, and the water in the bath replaced by water at room temperature, or 16.5°C . The ionisation-current gradually fell off, until at the end of between $3\frac{1}{2}$ and 4 hours it assumed the same values as obtained in the previous experiment for the same temperature.

An attempt was then made to obtain a set of readings by bubbling the air through the solution at 100°C . A condenser was connected up with the previous apparatus for the purpose of condensing the steam which would be otherwise driven over and condensed in the connecting tubes. A Kjeldahl trap was also used to prevent any loss of the solution. The experiment, however, was found to be impracticable under the conditions, if a uniform current of air was to be maintained. It was found to be impossible to prevent the water from condensing in



the rubber tubing attached to the flask. This changed the rate of flow causing the air to be forced out of the solution in irregular amounts which it was impossible to regulate without some form of automatic pressure-regulator.

Experiments were also carried out with the temperature of the solution at 20°C ., and at 30°C ., and the number of divisions per minute obtained after deducting the natural leak is shown on the curve (No. 1.)

By reference to the accompanying graph it will be seen that the value of the ionisation current for 100°C . can be extrapolated by producing the curve. The two probable points where the curve cuts the ordinate corresponding to 100°C . are A and B, the mean of which is at C, or the point 41.25. The intermediate values of the ionisation current can then be read off from the curve, and the fractional part of the emanation removed at any given temperature easily calculated. We thus find that by bubbling air through the solution at the rate of three bubbles per second, and for the size of tube used, the percentages of emanation removed for the temperatures below are—

64.7% at 16.5°C .

82.9% at 60°C .

66.7% at 30.0°C .

95.0% at 80°C .

68.6% at 40.0°C .

It thus appears quite evident that the temperature at which the amount of radium emanation in a solution is determined by the bubbling-method is a very important factor, and should always be definitely determined and kept constant during an experiment. The experiment also shows that at ordinary temperatures the error due to neglect of temperature considerations is not very serious, the effect of temperature being most marked between 30°C . and 100°C .

Summary

The object of this experiment was to study the release of radium emanation from water by bubbling air through the radium solution at different temperatures, at a definite rate of flow of air. Observations were made with the temperature of the solution at 16.5°C ., 20°C ., 30°C ., 60°C ., and 80°C ., and the results show that the release of the emanation is considerably increased as the temperature rises, naturally reaching an upper limit at 100°C .

It is proved that temperature is an important factor in the determination of radium emanation by the bubbling method, and should be known and kept constant during an experiment.

McGill University, Montreal.

May 5, 1916.

The Double Salts formed by Sodium and Potassium Carbonates.

By J. W. BAIN, F.R.S.C. and C. E. OLIVER

(Read May Meeting, 1916)

The present scarcity of potassium salts has stimulated their production from sources which had either been abandoned, or only worked in a desultory fashion. The ash of seaweeds, the residues from the sugar factory and wood ashes were valuable materials fifty years ago because of their potash contents, and the interruption of the supply from Germany has brought them into the market once more in appreciable quantities.

The methods of purifying the crude potassium chloride and sulphate found at Stassfurt have been worked out very exhaustively by van't Hoff and others, but similar information regarding the purification of potassium carbonate has never been published. The reason for this is, undoubtedly, that the carbonate has been manufactured entirely from the chloride in Germany and France, and no potassium carbonate has been refined elsewhere. Under the present circumstances when it is desired to produce the refined carbonate in Canada and the United States from such sources as wood ashes, data regarding the behaviour of solutions of the salts of sodium and potassium are essential. The information available is fragmentary and unsatisfactory so that a study of the subject was undertaken.

Before the investigation had progressed very far it was found that the separation of sodium and potassium carbonate offered difficulties which proved to be the result of the formation of a double salt. The latter, which has the formula $K_2CO_3, Na_2CO_3, 12H_2O$, has been described by Marguerite,¹ Marignac,² Fehling,³ Stolba,⁴ Kremann⁵ and Osaka.⁶ With the exception of Osaka who determined the solubility at 10° and 25° C., these authors describe the preparation, composition and crystal habit of the double salt; none investigated the range of its existence. To supply this gap the transition point was determined

¹ Ann. chim. phys. 56, 220, (1845).

² Compt. rend. 45, 650, (1857).

³ Annalen, 130, 247, (1864).

⁴ J. prak. Chem. 94, 406, (1865).

⁵ Monatsh. 30, 323.

⁶ Mem. Coll. Sc. Kyoto 3, 58.

by the dilatometer in these laboratories and found to be 35° C. The double salt undergoes the transformation indicated by the reaction. $3(\text{K}_2\text{CO}_3, \text{Na}_2\text{CO}_3, 12\text{H}_2\text{O}) \rightarrow 2\text{K}_2\text{CO}_3 + 26\text{H}_2\text{O} + \text{K}_2\text{CO}_3, 3\text{Na}_2\text{CO}_3, 10\text{H}_2\text{O}$. The latter double salt was described by Hugounenq and Morel,¹ who give no details as to the limits of its existence and are apparently unaware of the above transformation. Preliminary tests made here indicate the probability of a transition point at about 130° C., in the case of the latter salt.

The investigation into the conditions under which both of these double salts exist is still in progress.

¹ Compt. rend. 106, 1158 (1888).

The Occlusion of Iron by the Ammonium Phospho-Molybdate Precipitate.

By E. H. ARCHIBALD and H. B. KEEGAN

Presented by DR. R. F. RUTTAN, F.R.S.C.

(Read May Meeting, 1916.)

Apart from any theoretical considerations—which are not without considerable interest—the extent of the occlusion of iron by ammonium phospho-molybdate, and the conditions which influence the amount of iron occluded, must be known before the direct estimation of phosphorus can be made from solutions containing iron.

The chemicals used in this research were carefully selected and where necessary were treated for the elimination, as completely as possible, of any impurity.

The weights used were carefully standardized. All pipettes and burettes were re-calibrated.

The analysis of the precipitate involved the determination both of the phosphoric acid formed and of the iron carried down by the precipitate. For these purposes a modified method of Pemberton's was adopted. In the place of the usual filter for collecting the precipitate, a platinum Gooch crucible—carefully selected with the object of having the perforations somewhat smaller than usual and as regular in size as possible—was used to great advantage.

For dilute solutions the amount of iron occluded is independent of the concentration of the iron in the solution. For the more concentrated solutions, the amount of iron carried down increases with the concentration of the iron. In the case of a precipitate containing 0.0314 grams of P_2O_5 the iron occluded amounts to 0.0050 grams.

For solutions containing the same amount of iron but different amounts of phosphoric acid the amount of iron occluded increases somewhat more rapidly than the concentration of the phosphoric acid increases.

With solutions containing equal amounts of iron and of phosphoric acid, increasing the volume before precipitation did not diminish, appreciably, the occlusion of iron; which would tend to show that it is not mechanical inclusion that accounts for the carrying down of the iron.

Washing with different amounts of washing solution has no appreciable effect on the occlusion. It was further shown that occlusion takes place at the time of precipitation and it is not brought about by allowing a precipitate to stand in contact with an iron solution.

The occlusion is apparently due to the formation of a definite chemical compound.

University of British Columbia,
Syracuse University.

The Solubility of Aluminium Hydroxide in Solutions of Ammonia and of Ammonium Salts.

By E. H. ARCHIBALD and Y. HABASIAN

(Presented by DR. R. F. RUTTAN, F.R.S.C.)

(Read May Meeting, 1916)

The solubility of Aluminium hydroxide renders the exact estimation of this substance, under many conditions, very uncertain. But slight variations in the concentration of the precipitating reagents has a marked influence upon the solubility, while the temperature at which the precipitation takes place is not without appreciable effect. The difficulty of ascertaining the exact conditions under which equilibrium is attained probably accounts for the fact that, up to the present, no direct estimations of the solubility in ammonium hydroxide have been made. It was thought that it would be of interest to make by direct methods a study of the solubility of aluminium hydroxide in solutions of ammonium hydroxide and in solutions containing ammonium salts that are usually present when aluminium hydroxide is precipitated.

All the chemicals used were purified by standard methods. For instance, in the case of the aluminium salts, impurities consisting chiefly of iron and nickel were eliminated by converting the aluminium into soluble sodium aluminate and after removing the iron, decomposing the aluminate with carbon dioxide. The resulting aluminium hydroxide was dissolved in nitric acid and reprecipitated with ammonium hydroxide. This process was repeated eight times when all traces of sodium had disappeared. The alumina was then converted into the particular salt desired.

The solutions studied were sealed in glass tubes; this being necessary on account of the volatility of the ammonia. After equilibrium had been reached, in a bath provided with a properly regulated thermostat, the tubes were opened under conditions that insured no appreciable loss of ammonia; and the necessary analysis of the solution was then carried out.

It was found that the solubility of aluminium hydroxide increases with the strength of the ammonium hydroxide up to a certain concentration—that beyond this concentration the solubility diminishes owing to the formation of a more crystalline variety of aluminium compound.

The presence of both ammonium nitrate and ammonium chloride appreciably diminishes the solubility of aluminium hydroxide in ammonium hydroxide solutions. In the case of a solution that is $\frac{1}{2}$ normal as regards ammonia the amount of aluminium hydroxide dissolved in 100 c.c. of solution is reduced from 0.700 grams to 0.050 grams. The presence of potassium nitrate on the other hand considerably increases the solubility. This fact should receive more consideration in the quantitative estimation of aluminium as for instance in such substances as the feldspars.

University of British Columbia
Syracuse University.

*The Turn of Tidal Streams in Relation to the
Time of the Tide.*

By W. BELL DAWSON, M.A., D.Sc., M.Inst.C.E., F.R.S.C.
Superintendent of the Tidal and Current Survey.

(Abstract of Paper read before Section III of the Royal Society of Canada, at May Meeting, 1916.)

When the tidal undulation of the ocean enters estuaries or inlets on a coast, it not only causes a vertical rise and fall of the water surface, but also a horizontal movement of the water in reversed directions, known as tidal streams. The object of this paper is to discuss the time-relations between these two movements, with illustrative examples from the Eastern and Pacific coasts of Canada, which afford a specially good field because of the great variety in their types of tide. These examples were selected as a basis for the explanation of the subject; but in the present abstract they are merely cited.

The time-relation between high water and slack water, when the tidal stream is reversed in direction in estuaries, straits and inlets, is highly important to the mariner; but the discussion of the problem of the time-movements of tidal streams has been very restricted so far, chiefly for want of a clear classification of the conditions presented by the various types of inlets and estuaries.

For the purposes of the mariner, if a constant difference of time is determinable, between the time of high or low water and the time at which the current reverses its direction, the problem is solved; but if the time-relation is more complex, special tables of Slack Water must be calculated. A practical distinction must also be made according to the swiftness of the current. If the tidal flow is sufficiently moderate to allow of navigation at all times, it may answer the purpose to give data for the time of maximum current; but if the swiftness of the current makes navigation perilous or even impossible except at slack water, it is essential to know the time when the slack occurs. Hence in solving the problem, it may be either the moment of Maximum current or of Zero current that requires correlation with the time of the tide.

Classification.—In dealing with these questions, it is necessary to distinguish clearly the various characteristics of estuaries, straits and inlets, as well as the different types in the tide itself. There is to begin with, a condition under which there will be no current in

the main length of an inlet running in from the ocean. In an ordinary estuary, which is shallow relatively to its width, the tidal undulation proceeds along it as a wave of translation; but if the depth is great (say over 100 fathoms) and the width fairly uniform, the tidal impulse at the mouth causes the whole surface of the inlet to rise and fall simultaneously, without appreciable current. There are many such inlets in British Columbia. (See explanations in "Progress of the Tide in Deep Inlets and Ordinary Estuaries," by the present writer.)

The following classification may therefore be made:— (1) Ordinary estuaries; omitting deep inlets of uniform width from the mouth to the head, in which the current is usually inappreciable. (2) Straits of moderate depth; as there are some so-called straits with a continuous depth of 100 to 200 fathoms which may show the characteristics of the deep inlets. (3) Large basins or expanded inlets, connected with the ocean by narrow entrances; their area being so large that there is not time for them to fill up during the tidal period. This type of inlet is more common than might be supposed.

Types of tide.—The influence of the moon is exerted in three leading ways, in the periods of the three "months" in which the moon's motions take place. Although these influences are always present in some degree, the noteworthy fact is, that in any region some one of these influences is usually so dominant as to give a distinctive character to the tide. There are thus three types of tide:—(1) The Synodic, when the variation from springs to neaps, in accord with the moon's phases, is the predominant feature. (2) The Anomalistic, when the greatest variation is in accord with the moon's distance from perigee to apogee. (3) The Declination type, characterized by diurnal inequality which is so pronounced as to be the leading variation.

In dealing with time values, it is the declination influence which gives rise to the most striking variations. It is quite common for the time-interval to show an alternation of a full hour, on successive tides or slacks, when the moon is in high declination.

Estuaries.—In ordinary estuaries, in which the tidal undulation runs evenly, it is usual for the current to turn at a definite interval of time after high or low water. To obtain a constant time-relation, the chief proviso is that the tidal stations to which reference is made, are suitably situated in the estuary. The St. Lawrence estuary, 320 miles from its mouth to the head of tide water, affords a large-scale example; and the Bay of Fundy may also be classed as an estuary from the present standpoint. Estuaries may be passed by with these remarks, as they are fairly well understood and considerable publication exists regarding them.

Straits.—The complication in straits, as distinguished from estuaries, generally results from tidal undulations entering at both ends. In longer straits, this occasions complication from interference. In shorter straits, the flow is more directly the result of a difference of water-level, caused by difference in the time of arrival and the range of the tide at the two ends. It is remarkable to find, however, that all these proximate influences may be ignored; and the behaviour of the current brought into direct relation with the moon's movements, as their primary cause.

We may begin with straits in which the current, like the tide itself, is under the dominant influence of the moon's declination. Northumberland strait affords the best example, as principles discovered elsewhere were applied to it; and also the time of maximum current was accurately ascertained in each of its three narrows, by current-meter observations. In such a strait, when the moon is in high declination, the turn of the current is alternately earlier and later than the average, in relation to the time of high and low water; and the strength of one flood and one ebb in the day is much greater than the strength of the other two. To reduce the variations in the time-intervals to law, it was found necessary to classify the tides themselves, with distinction of the moon's transits. The high or low waters which follow the moon's Upper transit when in North declination, and those which follow the moon's Lower transit when in South declination, are termed "Similar." The remaining high or low waters, which follow the moon's Lower transit when North or the Upper transit when South, are termed "Opposite." It was also discovered that in Northumberland strait the flood is related to the tidal station in the entrance to the Gulf of St. Lawrence where the tide comes in from the ocean, and the ebb to the tidal station on the inland side of the Gulf, in the St. Lawrence estuary.

These principles of classification and distinction, have the widest application in dealing with time-differences which show a marked alternation when the moon is in high declination. In such cases it is also usual to find an appreciable annual variation with the sun's declination.

These methods have been fully elaborated in dealing with the time-differences between tide and slack water, for the calculation of Slack-water tables for Seymour Narrows on the Pacific coast. The series of alternating values resulting, has been further checked and revised by observations of slack water during a season in the 19-year cycle when the moon's range in declination was greatest. A full explanation of the successive approximations during recent years, in

arriving at a satisfactory system of calculation for these Narrows, would constitute a valuable contribution to this subject.

In dealing with a series of passes on the Pacific coast, which carry a heavy traffic, it was not practicable to publish tables of slack water for them all. Two of them were selected as standard passes, and the others are referred to these; as the difference in the time of slack water in neighbouring passes is found to be very constant. For the standard passes themselves, the method of reference to two tidal stations in the opposite directions for high-water and low-water slack respectively, has recently been adopted with marked improvement. The only departure from constancy is for annual variation; and this can be sufficiently allowed for, in the calculation of slack water, by a series of differences for successive calendar months.

The possibility of correlating the turn of the current with the time of the tide may be limited, where an extreme complexity is reached, because of two distinct types of tide at the two ends of a strait. This is the case in the Gut of Canso; and its currents have baffled hydrographic surveyors as well as navigators. At times, there is a diurnal tide at one end while the ordinary semi-diurnal tide continues at the other. As a consequence, the current may turn only once in the day, while at other times it turns twice, as tidal streams usually do. It was found, after careful investigation, that this change in behaviour is in complete accord with the moon's change in declination. There is a further complication however, due to dominant flow in one direction through the strait. Even when the moon is on the equator, and the duration of the flow should become equal each way, the current runs longer in the dominant direction. Under the conditions obtaining, it is only possible for the current to have a definite relation to the time of the tide when the moon is near the equator; that is, during two groups of about three days each which occur twice in the declination-month of $27\frac{1}{4}$ days.

Narrow inlets to large areas.—The problem in this case, would be reduced to its simplest conditions if a tide of uniform amplitude rose and fell rhythmically before a narrow entrance to an infinite area; that is, an area so large that there was practically no change of level within it. Although the current might be violent at high and low water, the time of slack water would correspond closely with half tide, when the level inside and out becomes momentarily the same.

In this class of inlet, if the current is reasonably moderate, there is a considerable choice of method admissible. (1) As slack water must be about the time of half tide, a comparison may be made with either the previous or following high or low water, in the endeavour to find the most constant time-interval between the two. (2) Instead

of correlating slack water directly with the time of high or low water, a more constant difference may be obtained with reference to the mid-time between high and low water, which may be termed the moment of half tide. (3) The time of maximum current, or the mid-time between slacks, may be used, instead of the time of slack water, in either of the ways above indicated. (4) These methods may further be combined with a distinction of the two slacks, or of flood and ebb; to refer them respectively to two tide stations in the oceanic and the inland directions, as may be found best. The method to be finally adopted, is the one which gives the most constant time-relations.

These various methods were thoroughly tried in dealing with the entrance to the Bras d'Or lakes; which consist of two expanses, the outer communicating with the ocean. The rise of the tide in the open is 3 to 5 feet, but the lakes have not time to fill up in the tidal period, and their variation in level is only about 6 inches. The methods as applied to this case, would well explain the matter. The best results, for the outer entrance as well as for the Narrows connecting the two expanses, was found by correlating the time of mid-flood and mid-ebb with high water and low water at different tidal stations in the opposite directions. Information in this form is quite satisfactory to the navigator.

Where the current is violent, and navigation is only possible near slack water, the methods available are much restricted. Such conditions are presented by Slingsby channel, opening by one narrow entrance into a series of six inlets and sounds branching off each other. This is opposite the northern end of Vancouver island and is developing as an important lumbering region. The rise of the tide in the open is 12 to 15 feet; while within the inlets it is only 6 to 8 feet at its greatest. The tide pours through in a torrent; and any attempt to tow lumber out, except at slack water, results in wreckage.

There was no constant relation between slack water and the time of the local tide; but for high-water slack, a constant time-difference was found with the tide of the open Pacific, on the outside of Vancouver island. For low-water slack, the time-intervals varied widely. It was found that the trouble really arose from the inequality in the time-intervals between successive slacks; these intervals becoming 10 hours and 15 hours alternately, when the moon is near its maximum declination. An exhaustive investigation was therefore undertaken to find some tide station where such an alternation was presented by the tide itself, in the hope that a constant difference would result. At two tide stations, in northern and southern British Columbia, the alternation in the intervals between successive high waters is greater and less respectively, than the intervals required. The values,

which make up the lunar day of $24\frac{3}{4}$ hours, are as follows:—At one station, $11\frac{3}{4}$ and 13 hours; at the other, 9 and $15\frac{3}{4}$ hours. The mid-time between high water at these two stations was therefore taken for comparison with low-water slack; and the result was a remarkably constant difference, though large in amount. A fuller explanation of this research would be of much interest.

Concluding notes.—The object in view is to obtain a constant difference between the time of high or low water, and the time when a tidal stream reverses its direction; or the time when it attains its maximum velocity. The difference may be considered as constant if the variation from the general average for the month or the year is within admissible limits. To supplement the explanations already made, the following points may be noted:—

(1) When the current is out of accord with the local tide, it may correspond with the tide of the open ocean beyond the local channels. This is especially likely in a strait or passage behind an island, where the tide comes round both ends of the island.

(2) When the current is sufficiently moderate for navigation to be possible at all stages of the tide, the time of maximum velocity may serve for practical purposes; as it may have a more constant relation to the time of the tide than slack water has. The time of the maximum can best be ascertained by current-meter observations.

(3) To obtain the differences with the time of the tide which are most nearly constant, it may be necessary to distinguish the two slack waters, or the maximum velocity on the flood and ebb respectively; and to deal with these separately, with reference to two different tide stations in opposite directions.

(4) When slack water cannot be brought into a constant relation with the tide at any station that can be found, a system of variable differences must be resorted to. It may be one only of the two slack waters that this is required for.

For calculation purposes, a series of variable differences may give quite as accurate results as a constant difference does in other cases; as any variation from the average always recurs in some astronomical period, and the variable series represents its reduction to law. The use of such a series entails the publication of tables of Slack Water in full; whereas if a constant difference can be arrived at, the mariner can apply this for himself to the tide tables indicated.

Transactions of The Royal Society of Canada

SECTION III

SERIES III

DECEMBER 1916

VOL. X

A Comparison of Radium Standard Solutions.—Continued.

By J. MORAN, M.Sc.

Presented by Prof. A. S. EVE, D.Sc., F.R.S.C.

(Read May Meeting, 1916).

PRELIMINARY.

In a set of experiments conducted during the session of 1915–1916, an attempt was made to determine as accurately as possible the values of the radioactive standard solutions in use at this university. The comparison was made by means of a Washington Standard solution. A litre of this was obtained by Eve in Sept. 1914, from Satterly of Toronto University. It was certified to contain 9.15×10^{-11} grams of the radium element per c.c., and to be correct with the International Standard to within one per cent. This consists of 21.99 milligrams of pure radium chloride, prepared by Mme. Curie, and preserved at Sèvres, France.

The standard solutions compared were the Rutherford-Boltwood strong and the Rutherford-Boltwood weak solutions. These solution standards were prepared by Boltwood from a known amount of radium bromide, determined by Eve by the γ -ray method. They were in the ratio of 100 : 1, one containing 1.57×10^{-7} and the other 1.57×10^{-9} grams of radium per c.c. The values assigned to these standards depend on the value of the Rutherford-Boltwood solid standard by which these solution standards were originally standardised. This solid standard was prepared in 1903, at McGill University, Montreal, and consisted of 3.69 milligrams of pure radium bromide, bought from Dr. Giesel of Germany, and presented to the University by Sir William Macdonald. It is now at Manchester University, England. Later on direct determination with the International Standard by Rutherford, and also by a number of cross-determinations with secondary standards which had also been compared with the International or the Vienna Standard, the solid

standard was found to be 4.9% low. Hence it was also to be expected that the solution standards would come out similarly if no error was made in their preparation. As a considerable amount of work has been done on the amount of emanation in air, and on the relative amounts of radium and uranium in rocks and water, the importance of knowing the correct values of these solution standards is evident.

In the course of the work referred to, it was for a long time difficult to get concordant results. It appeared on the evidence of the results of the observations taken over a long series of experiments that the solutions generally deteriorated in strength. The addition of some HC1 to one of the solutions which had been boiled a number of times seemed to cause a higher reading. It was discovered later that the HC1 used was itself radioactive, and that part at least of the increase was due to this cause. The balance of the increase was at that time set down to some of the radium salt being deposited from the solution in a "de-emanating" condition by boiling. In the latter part of this work the results obtained were more satisfactory, and the mean of several close results showed—

Rutherford-Boltwood Strong Solution : Washington :: 96 : 100.

Rutherford-Boltwood Weak Solution : Washington :: 98 : 100.

Refs. Phil. Mag., Oct., 1915. J. Moran.

Radioactive Substances and their Radiations. Rutherford.

OBJECT OF THIS WORK.

This work was undertaken—

(1) To study the causes of variation in some of last year's work, and to confirm or qualify the results then obtained.

(2) To determine if the solutions really deteriorated by boiling and if so, whether it was due to

(a) Deposition of the radium salt in a "de-emanating" condition; or,

(b) Some of the solution being carried over bodily into the collecting-apparatus by too vigorous boiling.

PROCEDURE.

The work was begun in August, 1915. There were then prepared seven solutions—three of Washington, two of Rutherford-Boltwood weak, and two of Rutherford-Boltwood strong. They were made up of the same strength. This time the HC1 used in preparing the solutions was re-distilled in the Chemistry Building by the writer, and tested for radioactive properties. Naturally, there was no trace of radioactive property in evidence.

Below are the solutions with their strengths—

Solution.	(Radium Content in Grams) $\times 10^9$.
Washington I.....	1.570
" II.....	1.573
" III.....	1.570
Rutherford—Boltwood Weak I.....	1.570
" " " II.....	1.570
" " Strong I.....	1.570
" " " II.....	1.567

The radium bromide solutions taken as above were drawn out of the standard bottles with a clean pipette, and weighed to the amounts stated. They were then carefully washed into a clean new flask of 500 c.c. capacity, and diluted up to 250 c.c. with distilled water. The flasks were then sealed with new rubber stoppers, tap-grease and sealing-wax, and wired down. The solutions were then allowed to stand for a month, at the end of which time the emanation had reached a maximum.

Meanwhile a new leaf had been put on the electroscope used previously, and the latter made absolutely air-tight as tested with a pressure-gauge. The electroscope was then calibrated, and that portion of the scale chosen which on testing with the solid radium standard gave the most uniform readings. The first set of results however, varied considerably, sometimes eight to ten per cent. A new electroscope made in the Physics Building gave no better results, and as the natural leak was fairly high, it was decided to make one in the Chemistry Building, entirely removed from radioactive influences, or as much as possible. A new 750 c.c. filter-flask was silvered with the following solution:—

(1) Alkaline AgNO_3 solution.

(2) Reducing solution, consisting of—

- (a) Cane sugar..... 90 grams.
- (b) Conc. HCl 4 c.c.
- (c) Ethyl alcohol..... 175 c.c.
- (d) Distilled water..... 1000 c.c.

This gave a beautiful silvering, and when made air-tight and calibrated gave a natural leak of only .07 division per minute. The readings obtained in the calibration were also very uniform. When the standards were now tested and the results were still unsatisfactory, all possible sources of error were gone into and classified. They are—

(1) Loss of emanation; which may include—

- (a) Failure to boil off all the emanation.
- (b) Leaks in vessels containing the emanation.

(2) Electroscope errors; including—

(a) Faulty leaf.

(b) Not continuously air-tight.

(c) Variation in the potential.

(d) Change in position of rest of leaf or rod, affecting the electrical capacity.

(e) Not charging to the same potential.

(3) Microscope errors.

(4) Errors in calculation.

(5) Heating effects.

(6) Variation of air-pressure inside the electroscope.

(7) Errors due to faulty stop-watch.

(1) (a) The Procedure in this case was to boil vigorously until the last bubble passed over. About one or two c.c. still remained in the bend of the delivery-tube. This was driven over by removing the flame for a moment until the flask slightly cooled, and the condensed water was allowed to follow the emanation up the delivery-tube, just beyond the rubber tubing leading to the flask. This ensured that the emanation did not escape into the room when the rubber tubing was removed for an instant to allow the air to rush in and dilute up the remaining emanation. It was now re-boiled for two or three minutes, after which the diluted portion remaining was negligible. A slight error was possible here in the earlier part of the work, owing to the bend of the delivery-tube being not rounded enough and also by not allowing the water to pass beyond the rubber tubing in re-boiling.

(b) All vessels containing the emanation, and the electroscope, were sealed with tap-grease and vacuum-wax, and the stoppers and rubber connections wired. Some very low readings, however, were traced to the rubber tubing having deteriorated where it was in contact with the pinchcock. This accounted for very divergent readings and occurred in only two or three instances.

(2) (a) The leaf was observed over the scale used, and did not show any sign of being faulty, such as giving a "kick" at a certain position. It was distinct at the edges.

(b) The electroscope was tested to see if it was air-tight before each set of observations by means of a pressure-gauge. It never showed the least sign of leakage after it had once been made air-tight.

(c) The potential could be varied by not having the inside of the electroscope earthed. This was carefully tested repeatedly and the earth-connections found to be working perfectly. Tin-foil from the inside of the electroscope was in direct connection with the earth-wire.

(d) The position of the rod and charging-key during observations affects the electrical capacity and this accounted for a slight error in the earlier observations. Later, it was kept in a definite position after charging the leaf, by pushing it back until it touched the inside of the electroscope in the case of the charging rod. The rod to which the gold-leaf was attached was maintained at the same standard position on the scale by slightly contracting or releasing the earth-wire.

(e) The leaf was always charged to the same division on the scale. Separate tests were made, however, by charging the leaf to varying positions on the scale; but it did not seem to make any appreciable difference. The same discrepancies occurred whether the leaf was charged to 25 or 35 on the scale.

(3) The microscope was in good condition, with a clear scale. It was fixed in position at the beginning of the experiment, focussed on the leaf and not moved afterwards.

(4) All errors in calculation were avoided by checking each experiment at the time it was done and re-checking a number of them at a time at a later date.

(5) Errors due to heating effects were avoided by having the light reflected into the electroscope from the source, the latter being further prevented from heating the electroscope by having it screened with paper. Heat was also turned off in the coils beneath the electroscope. This was very variable at times and in an earlier stage of the work may have introduced an error by causing convection currents in the electroscope.

(6) The pressure of the air inside the electroscope was always maintained at the pressure of the atmosphere obtaining at the time of the experiment. A rubber tube on the three-way tap connected to a glass tube dipping into water, furnished a means of showing when the air-pressure inside the electroscope was atmospheric.

(7) The stop-watch used in the earlier part of the work was new and guaranteed to keep good time. It was tested with the clock in the Elementary Laboratory of the Physics Building for ten consecutive instances over half-minute intervals; but it did not show any serious error. However, as a reliable jeweller claimed that, owing to the mechanism of it, there was likely to be a large error introduced at irregular intervals, it was decided to get a new chronometer, which by going continuously eliminated the possible source of error in the stop-watch.

The net result of these investigations was to prove that errors might be due to—

(a) Differing positions of the charging-rod and key.

(b) Failure to get over the last traces of emanation, owing to its remaining in the delivery-tube and escaping into the room on second boiling.

(c) Bad rubber tubing, accounting for the extremely low readings.

(d) Temperature changes from the coils.

(e) Possible irregularity in the time recorded by the stop-watch, due to faulty mechanism.

It was also decided as a precaution to use a Kjeldahl trap. This effectively prevents any of the radium solution from being driven over into the collecting-apparatus by too vigorous boiling: any that may be shot up into the bulb falls back again into the flask.

The results of these investigations were now acted upon, and the results showed a marked improvement. The second solution of Rutherford-Boltwood II, had to be discarded owing to some of the solution being lost through tube-burst in boiling.

An interesting development in the course of the latter part of this work is that there seemed to be no deterioration with boiling. This was first evident through all the solutions of the same kind having values in close agreement. It was finally settled by taking Washington III, which had been also made up in August, 1915, and never boiled. This one was first boiled, the emanation discarded and the flask sealed up. It was then boiled off at intervals of a week or more and the results obtained show them extremely close (see below) to those got for the other two preparations of the same standard which had been boiled off ten or twelve times. This not only gives consistent results for the standards, but settles the question of boiling. The readings of Washington III do not differ enough from I and II to warrant the conclusion that boiling causes deterioration. The apparent diminution of strength with boiling noticed in previous work must therefore have been due to lack of refinements in the apparatus and technique, such as have been investigated and summarised in this paper in a previous paragraph.

The following are the tables of results obtained:

FIGURES OF MERIT. (DATES OF MONTH GIVEN BENEATH).

WASHINGTON.			RUTHERFORD-BOLTWOOD.		
			Weak.		Strong.
I.	II.	III.	I.	II.	I.
6.65 9/3	6.60 11/3	6.69 16/3	6.42 28/3	6.41 13/3	6.58 25/3
6.57 17/3	6.83 24/3	6.71 23/3	6.44 3/4	6.48 27/3	6.40
.....	.....	6.64	.....	.....	(1915)
.....	.....	31/3	.....	.....	.....
6.61	6.71	6.68	6.43	6.44	6.49

TABLE OF MEANS.

Standard.	Figure of Merit.	Percentage.
Washington.....	6.67	100
Rutherford-Boltwood (Weak).....	6.43	96.4
Rutherford-Boltwood (Strong).....	6.49	97.3

As before stated, the results of last session showed—
 Rutherford-Boltwood Weak : Washington :: 98 : 100.
 Rutherford-Boltwood Strong : Washington :: 96 : 100.
 while Rutherford himself found the solid standard 4.9% low with the International and also with the Vienna Standards. Hence we also have

Rutherford-Boltwood Solid Standard : Washington :: 95.1 : 100.
 It will be noted that the present results differ somewhat from those of last year. In the case of the strong solution the mean of the results of last year and of this year are taken, owing to one of the solutions being discarded. The close agreement of duplicate results in the one case and of triplicate results in the other for the Rutherford-Boltwood weak and the Washington standard solutions puts their validity above question.

We thus have—

Rutherford-Boltwood Weak : Washington :: 96.4 : 100.

Rutherford-Boltwood Strong : Washington :: 97.3 : 100.

SUMMARY.

(1) The object of this experiment was to re-determine the values of the Rutherford-Boltwood weak and strong solution standards. They were prepared in the first place by means of the Rutherford-Boltwood solid standard, now at Manchester University, England, and this solid standard was found by Rutherford to be 4.9% low. If no error was made in their preparation we should expect the solution standards to come out similarly. The results of last session showed—

Rutherford-Boltwood Weak : Washington :: 98 : 100.

Rutherford-Boltwood Strong : Washington :: 96 : 100.

This time the re-determination showed them to be—

Rutherford-Boltwood Weak : Washington :: 96.4 : 100.

Rutherford-Boltwood Strong : Washington :: 97.3 : 100.

(2) In the work of last year it appeared that the radium bromide solutions deteriorated with each boiling. Also, that if a sufficient amount of HC1 were added the solution seemed to recover its normal emanating power. At that time no pure HC1, free from radioactive matter, was available. It was estimated at that time after testing a portion of HC1 from the same bottle as was used for the experiment, that a part of the increase in value was due to radioactive matter in the HC1 itself. The work of the present year, with pure HC1 free from radioactive matter, proves that the whole of the increase must have been due to the radioactive matter in the HC1. The excess then got was evidently due to lack of refinements in the apparatus. Also the boiling effect which seemed to be apparent last year was traced to the same cause.

McGill University, Montreal.

May 2nd, 1916.

Improved Methods in Hygrometry.

By A. NORMAN SHAW, B.A. (Cantab.), D.Sc. (McGill).

Presented by DR. H. T. BARNES, F.R.S., F.R.S.C.

(Read May Meeting, 1916.)

The object of this paper is to describe experiments with several hygrometers of simple construction which apparently give results of accuracy greater than that given by the instruments in common use. The lack of refinement in ordinary humidity determinations is generally recognized, so the account of an attempt at its improvement needs no extended introduction. A brief summary of the weaknesses and limitations of the customary methods is given here.

§ 1. SUMMARY OF THE LIMITATIONS OF THE HYGROMETRIC METHODS
IN GENERAL USE.

The following conclusions have been drawn from a series of tests performed with various hygrometers during the past year, and are in general agreement with existing records of the subject.

(a) "*Chemical*" and "*Vapour Pressure*" *Methods*. These require a considerable amount of time for the taking of an observation, and are usually elaborate. If the humidity remains constant it can be determined by some of these methods to within 0.1% of its true value. This requires, however, expert attention and "research" conditions. Under ordinary circumstances it is difficult to eliminate errors of less than two or three per cent. These methods are almost useless for the examination of a rapidly varying humidity, giving merely the average value during the time of observation.

Such methods as those of Brunner, Schwackhofer, Svenson and Edelmann may be classified under this heading and, as far as the criticism in regard to time, complexity and accuracy is concerned, those methods which involve the measurement of the amount of additional vapor necessary to produce saturation, may also be included.

(b) *Dew-Point Methods*. Under the most favourable circumstances an accuracy of greater than 1% cannot be assured. If the relative humidity is less than 20%, or if the temperature is below 40°F. errors as large as 10% may easily occur.


(c) *Wet-and-Dry-Bulb Methods*. Under the best conditions a good constancy of repetition may be obtained but an absolute accuracy of within 2% cannot be assured. If care of the wet sack and attention

to its ventilation are neglected, errors of greater than 5% may develop under apparently normal conditions. If either the relative humidity or the temperature is low, or if the relative humidity is approaching 100% the errors may be larger than 10%. The former conditions for such errors are very common during the winter in cold climates. Inside steam heated buildings, for example, the relative humidity will, when the temperature is below -20°F . outside, be sometimes as low as 5% and yet be indicated as high as 20% on an instrument which without alteration will record satisfactorily under average summer conditions:

(d) *Hygroscopic Expansion Methods*. Hygrometers of this kind especially those employing hair, gut, or horn need very frequent recalibrations and in a few months may become almost useless. After subjection to extreme conditions there are often large "after-effects" which vary in a complicated manner. If, however, these instruments are compared frequently with others over a large range of humidities they are the most convenient because their sensitiveness is great, the time needed for a determination of humidity is short, and the procedure merely that of reading a scale or chart. They have, perhaps, been over maligned by many observers, but it must be admitted that the necessity for frequent recalibration renders them unsuitable for accurate work outside the laboratory.

§ 2. A SATISFACTORY ABSORPTION HYGROMETER.

Among the instruments examined was a slightly modified copy of a hygrometer recently developed by Dr. E. K. Rideal and Mr. A. Hannah.¹ This instrument was found to be so convenient that it was adopted as one of the absolute methods in these experiments for checking determinations made by other means. The results obtained with it show an accuracy apparently greater than that claimed by its designers, and as the method is a new one it seems desirable to draw further attention to it.

Figure 1 is a photograph of a simple form of the instrument constructed in this laboratory. There is also a sheet of glass which is placed in front of the bulbs and gauge in order that there may be no heating effect when the observer is bending towards the scales. (A more compact form which can be immersed and operated in a constant temperature jacket is better suited for experimental tests in hygrometry over large ranges of temperature and humidity, but is unnecessary for the ordinary determination of the humidity in any place sheltered from the sun and from strong winds).  A

¹ Rideal and Hannah. *The Analyst*, vol. XL No. 467, p. 41, Feb. 1915.

sample of air of known volume can be drawn in through the three-way stop cock at the top on the right by lowering the mercury on the left. When this tap is turned the sample can be transferred to the upper bulb on the right and brought into contact with concentrated sulphuric acid which floats above the mercury on that side. This operation is performed simply by raising the mercury on the left and lowering that on the right. In the middle is a tube and stop cock leading to a xylol pressure gauge. The extra bulb connected to the other side of the gauge enables errors due to small temperature or pressure variations to be eliminated. To measure the original vapour pressure of the enclosed sample it is necessary to adjust the mercury level on the right to the known position it would have taken if a dry sample had been maintained at constant pressure, and *at the same time* to adjust the mercury on the left until the pressure as indicated by the gauge is the same as that of the extra compensating bulb. The absorption will then be indicated by the rise of the mercury in the tube above the bulb. From this the external vapour pressure can at once be calculated.

The whole apparatus can be constructed and calibrated by an amateur glass-blower in a few hours. It requires only four equal pipettes (20–50 cc.), three stop cocks, tubing, mercury, sulphuric acid and xylol. Once installed the acid will last for several hundred determinations and each observation requires only from 2 to 4 minutes. The calculation of a result is very simple.

If x is the existing vapour pressure, v the volume of one cm. of the tube up which the contraction is arranged to take place, V the volume of the sample drawn in, b the barometric pressure, and r the height of the contraction, then applying Boyle's Law to the volume of *dry* air we see that

$$(b - x) V = b (V - vr).$$

hence
$$x = \frac{v}{V} br.$$

The constant $\frac{v}{V}$ can be determined when the apparatus is constructed,

and b and r read from the barometer and the instrument itself. With the aid of curves for different pressures, or with the slide rule, the vapour pressure can be calculated from the reading in a few seconds.

A series of comparisons with the chemical method of weighing gave, when precautions were taken to use samples of air of the same humidity, no case of a divergence as great as 2%. The majority of observations were within 1% whether the temperature or humidity was high or low.

It should be noted that the custom of comparing hygrometers, or humidities by any method based on the assumption that two samples or regions of air examined at about the same time within a few feet of one another, will have the same humidity, is often most unreliable. The distribution of water vapour in a well-ventilated laboratory is usually far from homogeneous. The presence of free surfaces of liquid, the arrival of the observer, and the convection currents in the air may produce a quite appreciable variation. Comparisons should be made with prepared volumes of air of known moisture content.

The chief disadvantage of this method lies in the possibility of mixing the contents wrongly by a careless manipulation of the stop-cocks and mercury. Labelled valves, however, should safeguard the hygrometer from this accident at the hands of a novice.

§ 3. A SIMPLE WEIGHING HYGROMETER.

If a solution has an aqueous vapour pressure which is less than that of the air in contact with it, there will be an absorption of vapour until the two pressures become equal; and, if on the other hand its vapour pressure is greater, it will evaporate until the pressures are equalized. Solutions of highly deliquescent salts with a large amount of well ventilated surface per unit volume of solution were found to vary in weight with the atmospheric aqueous vapour pressure in a regular and sensitive manner, and a simple hygrometer based on this principle was constructed accordingly.

Unfortunately no general and accurate formula appears to have been obtained for connecting the aqueous vapour-pressure with the concentration of a solution. Such expressions as $\log_e \frac{f}{f'} = \frac{n}{N}$ are

almost useless if, as in the present case, there is any appreciable variation in the total volume of the liquid. A series of comparisons using prepared samples of air can, however, be made with an absolute hygrometer, and a chart or scale prepared which gives the vapour pressure at once for any indicated weight.

Fig. 2 is a photograph of a hygrometer prepared in this way. A solution of phosphorus pentoxide was used, it having first been allowed to absorb water vapour until its vapour pressure was equivalent to about 1 cm. of mercury. (Solutions of calcium chloride, cobalt

¹f = vapour pressure of solvent at given temperature.

f' = vapour pressure of solution at given temperature.

n = number of gram-molecules of solute.

N = number of gram-molecules of solvent (as vapour).

chloride and gelatine, and cupric chloride and gelatine were found also to be suitable but not so sensitive as the phosphorus pentoxide. The cobalt and the cupric chlorides change colour as the vapour pressure varies and roughly indicate the humidity in that additional way). A piece of clean filter paper 7×16 cms. was moistened with this solution and suspended from the arm of a balance in a bell jar. There were 83.9 sq. cms. of surface per gram of solution when the vapour pressure was equivalent to 2.10 cms. of mercury. The surrounding air, or any given samples of gas could be passed through the jar in a slow and regular manner by means of a faucet suction pump, or any similar apparatus. The figures in the table below illustrate the constant behaviour of this arrangement with a balance measuring to within 0.01g. The first three sets were taken on consecutive days in September 1915, and the last two in March, 1916. The temperature was in each case 23.0°C , which determined the constancy of vapour pressure of the saturated supplies of air prepared on the different occasions. The dry sample was bubbled through pure concentrated sulphuric acid and the saturated was bubbled through a long tube of distilled water. The other samples were of laboratory air which happened to have the same vapour pressure on these chosen days—this was tested simultaneously by chemical methods.

TABLE ILLUSTRATING THE CONSTANCY OF WEIGHT OF THE SOLUTION ON THE "MOISTENED PAPERS" UNDER SAME HUMIDITY CONDITIONS.

Air Dry.		Air Saturated at at 23.0°C .	Relative Humidity 57% at 23.0°C .
(V.p. negligible.)		(V.p. 2.10 cms.)	(V.p. 1.20 cms.)
Sept. 1915	1. 1.26 grams.	2.65 grams.	2.00 grams.
	2. 1.28 "	2.69 "	1.99 "
	3. 1.26 "	2.67 "	2.02 "
March, 1916	4. 1.26 "	2.68 "	2.02 "
	5. 1.26 "	2.67 "	2.01 "

In this particular case it will be noted that the change in weight is nearly proportional to the vapour pressure. 2.06 grams for a vapour pressure of 1.20 cms. would have corresponded to a proportional change, since

$$\frac{2.10}{1.20} = \frac{2.67 - 1.26}{2.06 - 1.26} \text{ approximately.}$$

In order to use the apparatus as a hygrometer it was necessary to make comparisons over a large range, as the proportionality was not so complete for lower vapour pressures. This was to be expected not only because the theory (incomplete) gives no indication of a true linear law but also because the influence of certain constant factors on the evaporation from the suspended paper was appreciable. A change in the rate of flow of the air, for example, would alter a reading sometimes by as much as three per cent. The following table gives a sample series of a number of comparisons of this hygrometer with other methods, after it had been calibrated. The results are given as vapour pressures in equivalent cms. of mercury, calculated in the case of the dew-point and the wet-and-dry bulb instruments from Marvin's psychrometric tables. The advantage of the new method is more apparent at the lower humidities, but the agreement throughout is much better than that of an ordinary series taken without special precautions.

TABLE OF ATMOSPHERIC VAPOUR PRESSURES ON VARIOUS DATES, AS DETERMINED BY THE DIFFERENT METHODS.

Tempera- ture.	Stationary Wet-and- dry Bulb.	Sling Psy- chrometer.	Dew-point Method.	Absolute Methods.		
				Weighing (old method).	Absorption (new method).	New Weighing Method.
24.1°C.	1.73 cms.	1.70 cms.	1.71 cms.	1.716cms.	1.73 cms.	1.72 cms.
17.0 "	0.89 "	0.86 "	0.86 "	0.873 "	0.87 "	0.87 "
17.0 "	0.76 "	0.71 "	0.72 "	0.730 "	0.73 "	0.72 "
20.0 "	0.82 "	0.74 "	0.74 "	.....	0.71 "	0.72 "
22.9 "	0.69 "	0.59 "	0.63 "	.....	0.57 "	0.56 "
21.3 "	0.42 "	0.36 "	0.39 "	.....	0.29 "	0.29 "
20.5 "	0.40 "	0.31 "	0.37 "	.....	0.28 "	0.28 "

A convenient form of the apparatus can be constructed by hanging the moistened paper from a delicate spring in a long vertical glass tube open at the ends, a small pointer indicating on a scale the vapour pressure corresponding to the various extensions. A steady circulation of the room air can be obtained by burning a very small "pilot light," gas or electric, just inside the *top* of the tube.¹

¹ The idea of using a steady convection current in this way instead of the more cumbrous suction method, was suggested to the writer by Dr. L. V. King of McGill University.

It is obviously advisable to protect the paper in these determinations from dust or from air super-saturated with moisture. In the latter case the weight of the paper will be increased, so that it indicates a higher vapour pressure than the true one, and if the deposition of water is sufficient, drops will collect and fall, removing some of the P_2O_5 .

Although such an instrument as this has, like many others, the disadvantage of being empirical and secondary, it appears to have the great advantage of being more constant and accurate although it is cheap and simple in construction. The vapour pressure can be read directly, and if the air is circulating constantly, there is no delay in the determination. In case of accident a supply of standardized moistened papers can be kept on hand, in order to avoid the necessity of calibration each time that a new one is needed. So far none of our moistened papers have deteriorated.

§ 4. ELECTRICAL METHODS OF HYGROMETRY.

Two promising electrical methods for the sensitive measurement of aqueous vapour pressure were developed. They are:—(1) To measure the electrical resistance of a hygroscopic insulator such as paraffin wax, when a convenient maximum amount of surface per unit volume is exposed; (2) to measure the electrical resistance of one of the “moistened papers” arranged as described in section 3.

Rapid and large variations resulting in errors of as much as four or five per cent, which are due chiefly to polarization and to lack of regularity in the flow of air, have not yet been eliminated. The matter seems worth recording, however, because when employed merely as hygrometers, these arrangements have shown a surprising sensitiveness, changes in vapour pressure of less than $\frac{1}{100}$ of 1% being detected with the aid of a sensitive galvanometer.

§ 5. REMARKS ON THE TERM “RELATIVE HUMIDITY.”

The term “relative humidity” has been given considerable prominence by many observers because it indicates directly the fraction of saturation. The dryness or dampness of a sample of air depends on the relative humidity and not upon either the absolute humidity, or the aqueous vapour pressure alone; but the importance of this expression has perhaps been over emphasized. If needed, it can always be obtained from the vapour pressure (or from the absolute humidity) and the temperature by means of the usual tables. As it is a function of both the absolute humidity *and* the temperature,

it should not be adopted as the chief means of defining the condition of humidity unless some especial advantage is gained thereby. Such an advantage may be claimed on the ground that the dryness or dampness of the air is of prime interest in this connection to meteorologists and physiologists, but this should not however, be the case. It has recently been pointed out very clearly by Dr. Leonard Hill, F.R.S.,¹ that the relative humidity is not the chief atmospheric factor on which our "sense of comfort" depends. Within certain limits the temperature of the air, the vapour pressure and the velocity of movement of the air may all vary in such a way that our "sense of comfort" remains unchanged, and on the other hand "our sense of comfort" may vary without a change in the relative humidity. Dr. Hill shows that the rate of heat-loss at body temperatures is an inclusive quantity which does provide a direct means of gauging our sense of comfort.

In chemical and physical problems it is usually either the moisture content or the aqueous vapour pressure of a sample of gas which is of more interest than its relative humidity. It is suggested, therefore, that it would be more convenient if humidity records contained the existing vapour pressure (or the absolute humidity) and the temperature rather than the relative humidity and the temperature.

The application of the hygrometer outlined in section 3 as a "wet kata-thermometer"² for a direct determination of the "sense of comfort" factor, measuring the rate of heat-loss in milli-calories per sq. cm. per sec., should be advantageous. If the electrical method could be perfected, it would probably be available for the determination of this quantity without appreciable modification.

Many thanks are due to Dr. C. J. Lynde for his kind interest in the present investigation.

Macdonald College,

McGill University.

May, 1916.

¹ Hill, Griffith and Flack, Phil. Trans. Roy. Soc. Lon., Series B, Vol. 207, pp. 183-220.

² Hill, Griffith and Flack. Loc. cit.

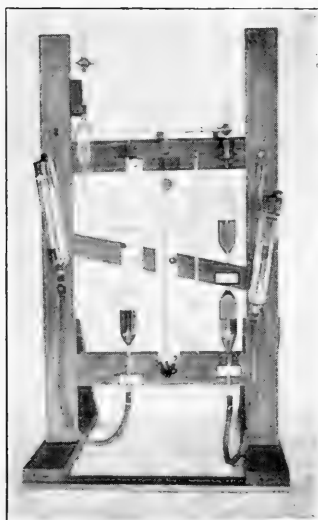


Figure 1.

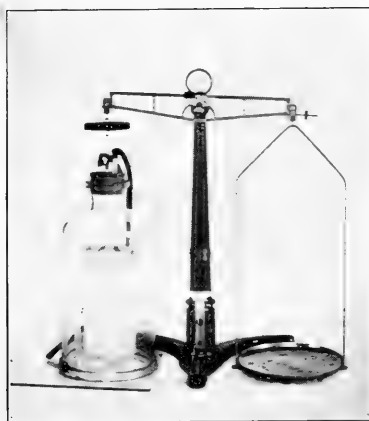


Figure 2.

Production of Ring Ice or Hoar Frost in Pipes.

By H. T. BARNES, D.Sc., F.R.S.C., Director of Physics,
McGill University.

(Read May 17th, 1916).

An interesting form of ice formation has recently come under the writer's notice which has on occasions given rise to some anxiety in places such as cold storage rooms where a dry pipe sprinkler system of fire protection has been installed.

Owing to the low temperature at which the cold storage rooms are kept, no system of fire protection can be employed which necessitates the retaining of water during the period of inaction. Various non-freezing liquids have been used in the pipes, such as brine or calcium chloride, but the practice now appears to be general to install what is called the dry pipe system. The dry pipe system consists of replacing all the water of the sprinkler piping by compressed air at about 40 lbs. pressure. The water is held back outside the cool rooms by a hydrostatic valve which is balanced by the air pressure in the pipe. As soon as a sprinkler head is opened the air rushes out lowering the pressure until the valve trips, and the water rushes through the pipe to the sprinkler in action. For many months and sometimes years no water enters the dry pipes, and consequently no accumulation of water can take place at any point unless supplied to the system from without. Usually just after a pipe system has been installed a hydrostatic test is made to discover the position of leaky joints. Immediately after, however, all the water is drained out and the pipes left as dry as possible. It is fair to assume, therefore, that any water remaining in elbows or crevices will become converted into solid ice whenever the pipes are below the freezing point. Air is pumped into the pipes at frequent intervals when the pressure drops below a given minimum. There is always a very slow leak even in the best constructed systems which has to be corrected by introducing more air. The intervals of pumping vary considerably depending of course on the tightness of the system. In a good installation about once a week is sufficient. In poor systems pumping once a day is often necessary.

It has been found on examination that ice appears inside the pipes and grows on the parts exposed to the coldest temperature. This ice forms as hoar frost and encircles the inside of the pipe grad-

ually closing in until only a small hole is left through the interior. It goes by the name of "ring ice," but the manner of formation is somewhat in dispute by those who have observed it most. From appearances the ice seems to be produced by direct freezing of water vapor on parts of the pipe interior. Such parts are easily found in the coldest rooms where the sprinkler pipe is placed too near the refrigerator pipes. Sometimes the sprinkler pipes touches the refrigerator pipes and becomes completely encased in an outward coating of hoar frost. In figure 1 is shown a typical case where the sprinkler pipe was found frozen solid with ring ice, at a place in the pipe where the sprinkler passes close to the ice encased refrigerator pipe. In figure 2 is shown an interior view of ring ice formation which was photographed by opening the sprinkler pipe. The ice is seen to be evenly distributed around the interior of the pipe.

It becomes a matter of some interest to determine how this ice is formed and where the water comes from, in sufficient quantity to block many feet of quite large pipe, sometimes two inches or more in diameter.

The most obvious source of water is that carried in by the pumping of the air into the piping. Another source is to be found in the evaporation of the water remaining in the pipes and the freezing of this vapor at the coldest points. Yet another source is in the water used to prime the valve at the pump house. This priming water is on the high pressure side of the system, and the vapor consequently has free access to the pipe interior. Slow distillation must ensue and a gradual accumulation of moisture at the coldest points. It must be recognized that this process is slow, but, notwithstanding this fact, the time factor runs into months and years in many cases, and thus little by little an obstruction of ice may be produced.

By far the most important must be the moisture drawn from outside, and pumped into the pipes with the compressed air. This has been for a long time recognized by those in charge of installations and in some places it is the practice to introduce a drying inlet. Such a drying system takes the form of a calcium chloride or lime filter where the air is drawn into the pump. A method of drawing the air from a cold chamber where the vapor pressure is small, is also used.

The amount of moisture pumped in will depend chiefly on the frequency of the pumping. Suppose the capacity of a sprinkler system to be on an average 60 cubic feet, which is about the amount of an average installation. During the summer with air at 70° Fahr. and 100% humidity there will be in each cubic foot 7.98 grains of water vapor at atmospheric pressure. To raise the pressure to 40 lbs.

in such a system will require approximate 163.3 cubic feet of air which will introduce about .1861 lb. of water vapor, provided no change of temperature results. Most of the water will be condensed at the pump and go to the check valve, and that required to saturate 60 cubic feet of air will be introduced.

With air at the same temperature but of 50% humidity practically the same amount of moisture will be introduced since a pressure increase to 30 lbs. will cause the air to become saturated. Less moisture however, will be condensed at the pump. In general it may be safe to say that the air on the high pressure side beyond the heat of compression will always be saturated whatever the temperature or humidity of the air drawn into the pump. No more moisture can be introduced than the amount required to maintain the maximum vapor pressure no matter what the air pressure may be. Hence we have the amount of moisture introduced at one pumping into the 60 cubic feet of pipe space equal to .0684 lb. of water vapor. If the system is pumped up once a week for six months we have 1.778 lb. of water vapor introduced. This represents 1.7 pints or 49.1 cubic inches.

Nearly all the vapor is condensed in the form of hoar frost at the coldest parts and a very considerable increase of volume results. Various estimates are given for the volume of snowy ice or hoar frost produced from a given volume of water which ranges from 4 to 40 times the original bulk. If the increase is only 4 times then the volume of hoar frost deposited in a pipe from the above example would be 196.4 cubic inches. This would be sufficient to block a foot of 4 inch pipe or $3\frac{1}{2}$ feet of $2\frac{1}{2}$ inch pipe. In general the increase of volume is taken as 10 times the original water volume, hence it does not seem surprising that blocks occur in a sprinkler system maintained in cold rooms. The following table will show the amount of water required, when converted into ring ice, to fill one foot length of various sized pipes.

TABLE SHOWING CUBICAL CONTENTS OF PIPES IN RELATION OF ACCUMULATION OF SNOWY ICE.

Diameter in Inches.	Capacity in Cubic Inches.	Amount of water, when converted into snowy ice which would fill one foot length of pipe taking increase of vol. —10 times.	
$\frac{3}{4}$	5.357	.0742 gill	
1.....	9.504	.132 "	
$1\frac{1}{4}$	14.69	.203 "	
$1\frac{1}{2}$	21.25	.294 "	
2.....	37.67	.523 "	
$2\frac{1}{2}$	58.93	.815 "	
3.....	84.85	1.172 "	
$3\frac{1}{2}$	115.42	1.594 "	
4.....	150.83	2.083 "	
5.....	235.70	3.26 "	
6.....	339.20	4.70 "	1.18 pints
8.....	603.25	8.35 "	2.09 "
10.....	942.5	13.02 "	3.25 "
12.....	1,357.3	18.8 "	4.70 "

In an unheated building in winter the ice formation is more likely to be spread uniformly throughout the entire sprinkler piping. Since the slow distillation of moisture must go on continuously from the warmer parts of the pipe to the colder, the presence of the priming water is always a possible source of supply.

The ring ice formation does not put any strain on the pipes as does ordinary freezing, and the only danger results from the material reduction of the pipe capacity. It is probable that most of the ring ice would be melted quickly during the first rush of water into the pipes, but this cannot be counted on in the winter months when the water from the mains is at or near the freezing point.

The writer wishes to acknowledge the courtesy of the Underwriters Bureau of New England, Mr. Gorham Dana, Manager, and Mr. S. L. Burgher, Inspector, for the excellent photographs shown here. The writer also expresses his indebtedness to Mr. C. L. Scofield, Manager, Sprinkler Risk Department of the Canadian Fire Underwriters Association for having drawn his attention to this subject and enabling a careful study to be made of these formations in Montreal.



Fig. 1.

Ring ice formation in a sprinkler pipe placed near a refrigerator main.

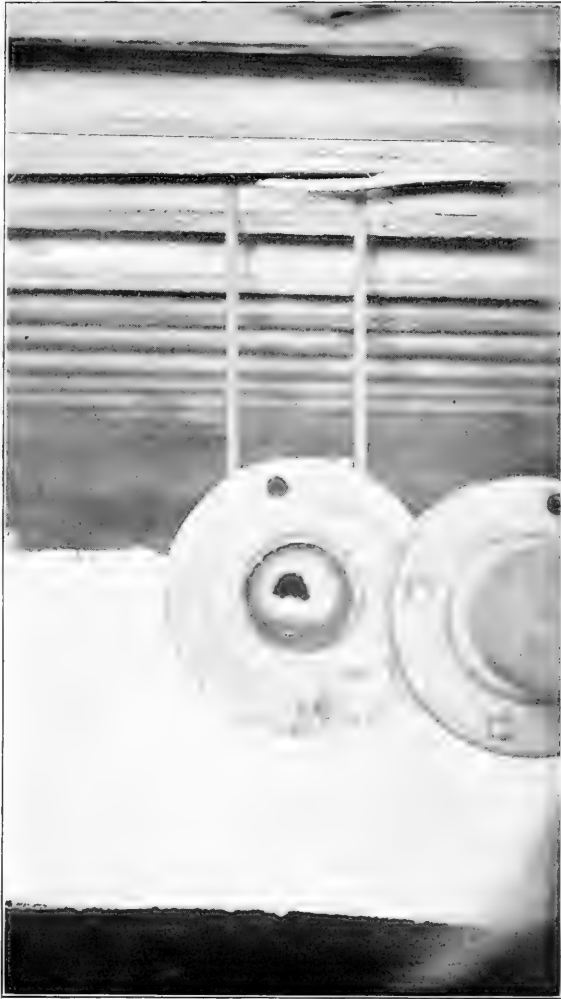


Fig. 2.

Ring ice formation shown in the interior of a
sprinkler pipe.

The Algebraic Basis of certain Bessel Series, including more particularly the Neumann Series of the second kind.

By JAMES HARKNESS, M.A., F.R.S.C.

(Read May Meeting, 1916).

§ 1. In this paper I propose to discuss certain series proceeding according to Bessel Functions and more particularly according to products of Bessel Functions—generally known as Neumann Series of the second kind—and to direct attention to the algebraic basis on which they rest. The definition adopted for Bessel's Function will be

$$J_{\nu}(x) = \sum_{s=0}^{\infty} \frac{(-1)^s}{s! \Gamma(\nu+s+1)} \left(\frac{x}{2}\right)^{\nu+2s}, \quad (1)$$

where ν is an arbitrary parameter. References will be made preferably to the exhaustive treatise of Dr. Niels Nielsen, *Handbuch der Theorie der Cylindèrfunktionen*, as this work contains in a convenient form most of the general theorems so far discovered relating to our subject. Occasional reference will also be made to Gray and Mathews, *Treatise on Bessel Functions*. We shall cite these two books, for brevity, as N. or G. and M. Free use will be made of Schönholzer's extremely useful theorem

$$J_{\nu}(x) J_{\rho}(x) = \sum_{s=0}^{\infty} \frac{(-1)^s}{\Gamma(\nu+s+1) \Gamma(\rho+s+1)} \binom{\nu+\rho+2s}{s} \left(\frac{x}{2}\right)^{\nu+\rho+2s} \quad (2)$$

(N. p. 20.)

§ 2. The following two formulae

$$\left(\frac{x}{2}\right)^{\nu-\rho} J_{\rho}(x) = \frac{\Gamma(\nu+1)}{\Gamma(\rho-\nu)} \sum_{s=0}^{\infty} \frac{\Gamma(\rho-\nu+s)}{s! \Gamma(\rho+s+1)} \left(\frac{x}{2}\right)^s J_{\nu+s}(x) \quad (3)$$

$$J_{\rho}(x) = \left(\frac{x}{2}\right)^{\rho-\nu} \sum_{s=0}^{\infty} \frac{(\nu+2s) \Gamma(\nu+s)}{\Gamma(\rho+s+1)} \binom{\rho-\nu}{s} J_{\nu+2s}(x) \quad (4)$$

have a general external similarity (N. pp. 268, 275). By equating corresponding powers of x on each side of (3), (4) after the J 's have been replaced by series of powers of x , it appears that the two formulae depend on two sets of identities of similar appearance but of essentially distinct character. The earlier members of these two sets of identities are

$$\left\{ \begin{aligned}
 \frac{1}{1! \rho+1} &= \frac{1}{\nu+1} - (\rho-\nu)_1 \frac{1}{\rho+1 \cdot \nu+1} \\
 \frac{1}{2! \rho+1 \cdot \rho+2} &= \frac{1}{2!} \frac{1}{\nu+1 \cdot \nu+2} - (\rho-\nu)_1 \frac{1}{1! \rho+1 \cdot \nu+1 \cdot \nu+2} \\
 &\quad + (\rho-\nu+2)_2 \frac{1}{2! \rho+1 \cdot \rho+2 \cdot \nu+1 \cdot \nu+2} \\
 \frac{1}{3! \rho+1 \cdot \rho+2 \cdot \rho+3} &= \frac{1}{3!} \frac{1}{\nu+1 \cdot \nu+2 \cdot \nu+3} \\
 &\quad - (\rho-\nu)_1 \frac{1}{2! \rho+1 \cdot \nu+1 \cdot \nu+2 \cdot \nu+3} \\
 &\quad + (\rho-\nu+1)_2 \frac{1}{2! \rho+1 \cdot \rho+2 \cdot \nu+1 \cdot \nu+2 \cdot \nu+3} \\
 &\quad - (\rho-\nu+2)_3 \frac{1}{3! \rho+1 \cdot \rho+2 \cdot \rho+3 \cdot \nu+1 \cdot \nu+2 \cdot \nu+3} \\
 &\text{etc.,}
 \end{aligned} \right. \quad (A)$$

and

$$\left\{ \begin{aligned}
 \frac{1}{1! \rho+1} &= \frac{1}{\nu+1} - (\rho-\nu)_1 \frac{1}{\rho+1 \cdot \nu+1} \\
 \frac{1}{2! \rho+1 \cdot \rho+2} &= \frac{1}{2!} \frac{1}{\nu+1 \cdot \nu+2} - (\rho-\nu)_1 \frac{\nu+2}{1! \rho+1 \cdot \nu+1 \cdot \nu+2 \cdot \nu+3} \\
 &\quad + (\rho-\nu)_2 \frac{\nu+4}{2! \rho+1 \cdot \rho+2 \cdot \nu+2 \cdot \nu+3 \cdot \nu+4} \\
 \frac{1}{3! \rho+1 \cdot \rho+2 \cdot \rho+3} &= \frac{1}{3!} \frac{1}{\nu+1 \cdot \nu+2 \cdot \nu+3} \\
 &\quad - (\rho-\nu)_1 \frac{\nu+2}{2! \rho+1 \cdot \nu+1 \cdot \nu+2 \cdot \nu+3 \cdot \nu+4} \\
 &\quad + (\rho-\nu)_2 \frac{\nu+4}{1! \rho+1 \cdot \rho+2 \cdot \nu+2 \cdot \nu+3 \cdot \nu+4 \cdot \nu+5} \\
 &\quad - (\rho-\nu)_3 \frac{\nu+6}{\rho+1 \cdot \rho+2 \cdot \rho+3 \cdot \nu+3 \cdot \nu+4 \cdot \nu+5 \cdot \nu+6} \\
 &\text{etc.}
 \end{aligned} \right. \quad (B)$$

in which the symbol m_r stands for $m(m-1)(m-2)\dots$ to r factors.

The identities in their general forms may be written:

$$\frac{\nu+1 \cdot \nu+2 \dots \nu+s}{\rho+1 \cdot \rho+2 \dots \rho+s} = 1 - \binom{s}{1} \frac{(\rho-\nu)_1}{\rho+1} + \binom{s}{2} \frac{(\rho-\nu+1)_2}{\rho+1 \cdot \rho+2} - \binom{s}{3} \frac{(\rho-\nu+2)_3}{\rho+1 \cdot \rho+2 \cdot \rho+3} + \dots \quad (5)$$

$$\begin{aligned}
1 &= \frac{\rho+1 \cdot \rho+2 \dots \rho+s}{\nu \cdot \nu+1 \cdot \nu+2 \dots \nu+s} \nu - \binom{s}{1} (\rho-\nu)_1 \frac{\rho+2 \dots \rho+s}{\nu+1 \dots \nu+s+1} \cdot \nu+2 \\
&\quad + \binom{s}{2} (\rho-\nu)_2 \frac{\rho+3 \dots \rho+s}{\nu+2 \dots \nu+s+2} \cdot \nu+4 \dots \\
&\quad + (-1)^s (\rho-\nu)_s \frac{1}{\nu+s \dots \nu+2s} \cdot \nu+2s,
\end{aligned} \tag{6}$$

where we use $\binom{s}{r}$ as the equivalent of ${}_s C_r$. The value of $\binom{s}{0}$ will be taken to be 1.

The identity (5) may be proved as follows:

Assume that it holds for $s-1$, so that

$$\frac{\nu+1 \cdot \nu+2 \dots \nu+s-1}{\rho+1 \cdot \rho+2 \dots \rho+s-1} = 1 - \binom{s-1}{1} \frac{(\rho-\nu)_1}{\rho+1} + \binom{s-1}{2} \frac{(\rho-\nu+1)_2}{\rho+1 \cdot \rho+2} - \dots,$$

$$\begin{aligned}
\text{and } \frac{\nu+1 \cdot \nu+2 \dots \nu+s-1}{\rho+2 \cdot \rho+3 \dots \rho+s} &= 1 - \binom{s-1}{1} \frac{(\rho-\nu+1)_1}{\rho+2} \\
&\quad + \binom{s-1}{2} \frac{(\rho-\nu+2)_2}{\rho+2 \cdot \rho+3} - \dots,
\end{aligned}$$

Then

$$\begin{aligned}
&\frac{\nu+1 \cdot \nu+2 \dots \nu+s}{\rho+1 \cdot \rho+2 \dots \rho+s} \\
&= \frac{\nu+1 \cdot \nu+2 \dots \nu+s-1}{\rho+1 \cdot \rho+2 \dots \rho+s-1} \cdot \left(1 - \frac{\rho-\nu}{\rho+s}\right) \\
&= \frac{\nu+1 \cdot \nu+2 \dots \nu+s-1}{\rho+1 \cdot \rho+2 \dots \rho+s-1} - \frac{\rho-\nu}{\rho+1} \cdot \frac{\nu+1 \cdot \nu+2 \dots \nu+s-1}{\rho+2 \cdot \rho+3 \dots \rho+s} \\
&= 1 - \binom{s-1}{1} \frac{(\rho-\nu)_1}{\rho+1} + \binom{s-1}{2} \frac{(\rho-\nu+1)_2}{\rho+1 \cdot \rho+2} \\
&\quad - \binom{s-1}{3} \frac{(\rho-\nu+2)_3}{\rho+1 \cdot \rho+2 \cdot \rho+3} + \dots \\
&\quad - \binom{s-1}{0} \frac{(\rho-\nu)_1}{\rho+1} + \binom{s-1}{1} \frac{(\rho-\nu+1)_2}{\rho+1 \cdot \rho+2} \\
&\quad - \binom{s-1}{2} \frac{(\rho-\nu+2)_3}{\rho+1 \cdot \rho+2 \cdot \rho+3} + \dots \\
&= 1 - \binom{s}{1} \frac{(\rho-\nu)_1}{\rho+1} + \binom{s}{2} \frac{(\rho-\nu+1)_2}{\rho+1 \cdot \rho+2} \\
&\quad - \binom{s}{3} \frac{(\rho-\nu+2)_3}{\rho+1 \cdot \rho+2 \cdot \rho+3} + \dots
\end{aligned}$$

Thus if (5) holds for $s-1$ it must also hold for s . As the identity is true for $s=1, 2, 3$, it follows by mathematical induction that it is true generally.

The identity (6) can also be proved by mathematical induction. It holds, as we can verify without difficulty, for $s=1, 2, 3$. Assume that it holds for $s-1$; then

$$1 = \frac{\rho+1 \cdot \rho+2 \dots \rho+s-1}{\nu+1 \cdot \nu+2 \dots \nu+s-1} - \binom{s-1}{1} (\rho-\nu)_1 \frac{\rho+2 \cdot \rho+3 \dots \rho+s-1}{\nu+1 \cdot \nu+2 \dots \nu+s} \cdot \nu+2 \\ + \binom{s-1}{2} (\rho-\nu)_2 \frac{\rho+3 \dots \rho+s-1}{\nu+2 \cdot \nu+3 \dots \nu+s+1} \cdot \nu+4 - \dots \\ + (-1)^{s-1} (\rho-\nu)_{s-1} \frac{1}{\nu+s-1 \dots \nu+2s-2} \cdot \nu+2s-2 \quad (i)$$

Replace ρ by $\rho+1$ and ν by $\nu+2$; hence

$$1 = \frac{\rho+2 \cdot \rho+3 \dots \rho+s}{\nu+2 \cdot \nu+3 \dots \nu+s+1} \cdot \nu+2 \\ - \binom{s-1}{1} (\rho-\nu-1)_1 \frac{\rho+3 \cdot \rho+4 \dots \rho+s}{\nu+3 \cdot \nu+4 \dots \nu+s+2} \cdot \nu+4 \\ + \binom{s-1}{2} (\rho-\nu-1)_2 \frac{\rho+4 \cdot \rho+5 \dots \rho+s}{\nu+4 \cdot \nu+5 \dots \nu+s+3} \cdot \nu+6 + \dots \\ + (-1)^{s-1} (\rho-\nu-1)_{s-1} \frac{1}{\nu+s+1 \dots \nu+2s} \quad (ii)$$

Multiply (ii) by $\frac{\rho-\nu}{\nu+s}$ and (i) by $\frac{\rho+s}{\nu+s}$, thus obtaining

$$\frac{\rho-\nu}{\nu+s} = (\rho-\nu)_1 \frac{\rho+2 \cdot \rho+3 \dots \rho+s}{\nu+2 \cdot \nu+3 \dots \nu+s+1} \cdot \frac{\nu+2}{\nu+s} \\ - \binom{s-1}{1} (\rho-\nu)_2 \frac{\rho+3 \cdot \rho+4 \dots \rho+s}{\nu+3 \cdot \nu+4 \dots \nu+s+2} \cdot \frac{\nu+4}{\nu+s} + \dots \\ + (-1)^{s-1} (\rho-\nu)_s \frac{1}{\nu+s \cdot \nu+s+1 \dots \nu+2s} \cdot \nu+2s \quad (iii)$$

and

$$\frac{\rho+s}{\nu+s} = \frac{\rho+1 \cdot \rho+2 \dots \rho+s}{\nu+1 \cdot \nu+2 \dots \nu+s} - \binom{s-1}{1} (\rho-\nu)_1 \frac{\rho+2 \cdot \rho+3 \dots \rho+s}{\nu+1 \cdot \nu+2 \dots \nu+s} \cdot \frac{\nu+2}{\nu+s} \\ + \binom{s-1}{2} (\rho-\nu)_2 \frac{\rho+3 \dots \rho+s}{\nu+2 \dots \nu+s+1} \cdot \frac{\nu+4}{\nu+s} \dots \quad (iv)$$

Subtract (iii) from (iv) and we get the identity (6), thus completing the proof by mathematical induction. Incidentally we have to use the entirely elementary but interesting identities

$$(s-1)(\nu+s+1)+1 \cdot (\nu+1) = s(\nu+s) \\ (s-2)(\nu+s+2)+2(\nu+2) = s(\nu+s) \\ (s-3)(\nu+s+3)+3(\nu+3) = s(\nu+s), \text{ etc.}$$

Attention is called to the presence of the factors $\nu, \nu+2, \nu+4, \dots, \nu+2s$ in (6); such factors are of common occurrence in the theory of series proceeding according to Bessel Functions, but the algebraic identities such as (6) containing these factors in an analogous way do not seem to have been specially studied.

It is useful to verify in a special case, say $s=4$, that if we start with the assumption that 1 can be expressed in the form

$$1 = \frac{\rho+1 \cdot \rho+2 \cdot \rho+3 \cdot \rho+4}{\nu+1 \cdot \nu+2 \cdot \nu+3 \cdot \nu+4} + (\rho-\nu)_1 \frac{\rho+2 \cdot \rho+3 \cdot \rho+4}{\nu+1 \cdot \nu+2 \cdot \nu+3 \cdot \nu+4 \cdot \nu+5} t \\ + (\rho-\nu)_2 \frac{\rho+3 \cdot \rho+4}{\nu+2 \cdot \nu+3 \cdot \nu+4 \cdot \nu+5 \cdot \nu+6} u \\ + (\rho-\nu)_3 \frac{\rho+4}{\nu+3 \cdot \nu+4 \cdot \nu+5 \cdot \nu+6 \cdot \nu+7} v \\ + (\rho-\nu)_4 \frac{1}{\nu+4 \cdot \nu+5 \cdot \nu+6 \cdot \nu+7 \cdot \nu+8} w,$$

where t, u, v, w are functions of ν only, it is easy to find the value $w=\nu+8$ by putting $\rho=-4$; the value $v=\nu+6$ by putting $\rho=-3$, etc. As the biquadratic equation in ρ is satisfied by $\rho=\nu$ as well as by $\rho=-4, -3, -2, -1$, the relation must be an identity.

§ 3. The formula (6) may be written

$$\frac{1}{\rho+1 \cdot \rho+2 \dots \rho+s} = \frac{1}{\nu+1 \cdot \nu+2 \dots \nu+s} \\ - \binom{s}{1} \frac{\nu+2}{\nu+1 \cdot \nu+2 \dots \nu+s+1} \frac{(\rho-\nu)_1}{\rho+1} \\ + \binom{s}{2} \frac{\nu+4}{\nu+2 \dots \nu+n+2} \frac{(\rho-\nu)_2}{\rho+1 \cdot \rho+2} - \text{etc.}$$

that is,

$$\frac{1}{\rho+1 \cdot \rho+2 \dots \rho+s} = B_0 + B_1 \frac{(\rho-\nu)_1}{\rho+1} + B_2 \frac{(\rho-\nu)_2}{\rho+1 \cdot \rho+2} \\ + B_3 \frac{(\rho-\nu)_3}{\rho+1 \cdot \rho+2 \cdot \rho+3} + \dots,$$

where the B 's depend on ν , but are independent of ρ .

The general value of the coefficients B is given by

$$B_t = (-1)^t \frac{\nu+2t}{\nu+s \cdot \nu+s+1 \dots \nu+s+t}$$

The B 's can be found by an independent method which gives in succession B_0, B_1, B_2, \dots . For this purpose replace ρ successively by the values $\nu, \nu+1, \nu+2, \dots$. This gives a set of linear equations.

$$\left\{ \begin{aligned} B_0 &= \frac{1}{\nu+1 \dots \nu+s}, \\ B_0 + \frac{1}{\nu+2} B_1 &= \frac{1}{\nu+2 \cdot \nu+3 \dots \nu+s+1}, \\ B_0 + \frac{2}{\nu+3} B_1 + \frac{2 \cdot 1}{\nu+3 \cdot \nu+4} B_2 &= \frac{1}{\nu+3 \cdot \nu+4 \dots \nu+s+2}, \\ B_0 + \frac{3}{\nu+4} B_1 + \frac{3 \cdot 2}{\nu+4 \cdot \nu+5} B_2 + \frac{3 \cdot 2 \cdot 1}{\nu+4 \cdot \nu+5 \cdot \nu+6} B_3 \\ &= \frac{1}{\nu+4 \cdot \nu+5 \dots \nu+s+3}, \text{ etc.} \end{aligned} \right. \quad (7)$$

by solving which we find that

$$\frac{1!}{\nu+2} \cdot \frac{2!}{\nu+3 \cdot \nu+4} \cdot \frac{3!}{\nu+4 \cdot \nu+5 \cdot \nu+6} \cdots \frac{t!}{\nu+t+1 \cdots \nu+2t} B_t =$$

$$\begin{vmatrix} 1 & 0 & 0 & 0 & 0 & 0 \cdots & \frac{1}{\nu+1 \cdots \nu+s} \\ 1 & \frac{1}{\nu+2} & 0 & 0 & 0 & 0 \cdots & \frac{1}{\nu+2 \cdots \nu+s+1} \\ 1 & \frac{2}{\nu+3} & \frac{2!}{\nu+3 \cdot \nu+4} & 0 & 0 & 0 \cdots & \frac{1}{\nu+3 \cdots \nu+s+2} \\ 1 & \frac{3}{\nu+4} & \frac{3 \cdot 2}{\nu+4 \cdot \nu+5} & \frac{3 \cdot 2 \cdot 1}{\nu+4 \cdot \nu+5 \cdot \nu+6} & 0 & \cdots & \frac{1}{\nu+4 \cdots \nu+s+3} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \end{vmatrix} \quad (8)$$

This provides a means for evaluating a determinant of rather remarkable structure.

§ 4. By the following simple method we can get an identity which will serve for the algebraic basis of (i) a theorem in Gamma Functions and (ii) a theorem in Bessel Series, and which at the same time exhibits the factors $\nu, \nu+2, \nu+4, \nu+6, \dots$

$$1 = \frac{\nu+s}{\nu+s}$$

$$= \frac{\nu}{\nu+s} + s \frac{\nu+s+1}{\nu+s \cdot \nu+s+1}$$

$$= \frac{\nu}{\nu+s} + s \frac{\nu+2}{\nu+s \cdot \nu+s+1} + s(s-1) \frac{1}{\nu+s \cdot \nu+s+1}$$

$$= \frac{\nu}{\nu+s} + s \frac{\nu+2}{\nu+s \cdot \nu+s+1} + s(s-1) \frac{\nu+s+2}{\nu+s \cdot \nu+s+1 \cdot \nu+s+2}$$

$$= \frac{\nu}{\nu+s} + s \frac{\nu+2}{\nu+s \cdot \nu+s+1} + s(s-1) \frac{\nu+4}{\nu+s \cdot \nu+s+1 \cdot \nu+s+2}$$

$$+ s(s-1)(s-2) \frac{(\nu+6)+(s-3)}{\nu+s \cdot \nu+s+1 \cdot \nu+s+2 \cdot \nu+s+3} \quad (9)$$

By continuing this process until zero factors make their appearance, we infer that

$$1 = \frac{\nu}{\nu+s} + s \frac{\nu+2}{\nu+s \cdot \nu+s+1} + s(s-1) \frac{\nu+4}{\nu+s \cdot \nu+s+1 \cdot \nu+s+2}$$

$$+ \dots + s! \frac{\nu+2s}{\nu+s \cdot \nu+s+1 \cdots \nu+2s}$$

When both sides are multiplied by $\frac{1}{\Gamma(\nu+s)}$, the identity takes the form

$$\frac{1}{\Gamma(\nu+s)} = \frac{\nu}{\Gamma(\nu+s+1)} + s \frac{\nu+2}{\Gamma(\nu+s+2)} + s(s-1) \frac{\nu+4}{\Gamma(\nu+s+3)} + \dots$$

$$+ s! \frac{\nu+2s}{\Gamma(\nu+2s+1)} \cdots \quad (10)$$

If we multiply both sides by $\frac{(-1)^s \left(\frac{x}{2}\right)^{\nu+2s}}{s!}$, the various terms of (10) are the general terms in the expansions of $\frac{x}{2} J_{\nu-1}(x)$, $\nu J_{\nu}(x)$, $(\nu+2) J_{\nu+2}(x)$, etc.; hence we get Lommel's theorem

$$\frac{x}{2} J_{\nu-1}(x) = \nu J_{\nu}(x) + (\nu+2) J_{\nu+2}(x) + (\nu+4) J_{\nu+4}(x) + \dots \quad (11)$$

(N. p. 270).

§ 5. In the kind of analysis that we have been considering it is useful to notice that the results arising from the formula in partial fractions

$$\frac{s!}{\nu+1 \cdot \nu+2 \cdot \dots \cdot \nu+s+1} = \frac{1}{\nu+1} - \binom{s}{1} \frac{1}{\nu+2} + \binom{s}{2} \frac{1}{\nu+3} - \dots$$

$$+ (-1)^s \frac{1}{\nu+s+1}$$

by making $s = 1, 2, 3, \dots$, have analogues in which two or more factors occur in the denominators. For instance

$$\frac{2 \cdot 3 \cdot \dots \cdot s+1}{\nu+1 \cdot \nu+2 \cdot \dots \cdot \nu+s+2} = \frac{1}{\nu+1 \cdot \nu+2} - \binom{s}{1} \frac{1}{\nu+2 \cdot \nu+3}$$

$$+ \binom{s}{2} \frac{1}{\nu+3 \cdot \nu+4} - \dots + (-1)^s \frac{1}{\nu+s+1 \cdot \nu+s+2},$$

and

$$\frac{3 \cdot 4 \cdot \dots \cdot s+2}{\nu+1 \cdot \nu+2 \cdot \dots \cdot \nu+s+3} = \frac{1}{\nu+1 \cdot \nu+2 \cdot \nu+3} - \binom{s}{1} \frac{1}{\nu+2 \cdot \nu+3 \cdot \nu+4}$$

$$+ \binom{s}{2} \frac{1}{\nu+3 \cdot \nu+4 \cdot \nu+5} - \dots + (-1)^s \frac{1}{\nu+s+1 \cdot \nu+s+2 \cdot \nu+s+3}.$$

Nielsen bases part of his discussion of Neumann series of the first kind on the identity

$$\sum_{p=0}^m (-1)^p \binom{m}{p} \frac{\nu+2r-2p}{\Gamma(\nu+2r-p+1)} \Gamma(\nu+2r-m-p) = 0, \quad m \geq 1$$

(N. p. 271). The algebraic equivalent is, of course,

$$\frac{\nu+2r}{\nu+2r \cdot \nu+2r-1 \cdot \dots \cdot \nu+2r-m} - \binom{m}{1} \frac{\nu+2r-2}{\nu+2r-1 \cdot \dots \cdot \nu+2r-m-1}$$

$$+ \binom{m}{2} \frac{\nu+2r-4}{\nu+2r-2 \cdot \dots \cdot \nu+2r-m-2} - \dots = 0 \quad (12)$$

His method of proof depends on the use of Δ^s , the difference of the s th order. The following proof is based ultimately on the same order of ideas, but has a more elementary appearance.

Replace ν by $\nu-2r-2m-1$ in the general formula patterned after the type of those given at the beginning of this paragraph. Employ m and $m+1$ factors respectively in the denominators, replace s by m , $m-1$ respectively; and reverse the order of the series. We then get

$$\begin{aligned} & \frac{1}{\nu+2r-1 \dots \nu+2r-m} - \binom{m}{1} \frac{1}{\nu+2r-2 \dots \nu+2r-m-1} \\ & + \binom{m}{2} \frac{1}{\nu+2r-3 \dots \nu+2r-m-2} - \dots \\ & = (-1)^m \frac{2m \cdot 2m-1 \dots m+1}{\nu+2r-1 \dots \nu+2r-2m} \end{aligned} \quad (i)$$

$$\begin{aligned} & \frac{1}{\nu+2r-1 \dots \nu+2r-m-1} - \binom{m-1}{1} \frac{1}{\nu+2r-1 \dots \nu+2r-m-2} \\ & + \binom{m-1}{2} \frac{1}{\nu+2r-2 \dots \nu+2r-m-3} - \dots \\ & = (-1)^{m-1} \frac{2m \cdot 2m-1 \dots m+1}{\nu+2r-1 \dots \nu+2r-2m} \cdot \frac{1}{m} \end{aligned} \quad (ii)$$

and (i) + m (ii) gives the required formula (12).

§ 6. We shall next prove the identity

$$\begin{aligned} 2^{3s} \frac{s! s!}{2s+1!} \frac{1}{2\nu+1 \cdot 2\nu+3 \dots 2\nu+2s+1} &= \frac{\nu+1}{1 \cdot 2\nu+1 \cdot \nu+1 \cdot \nu+2 \dots \nu+s+1} \\ &- \binom{s}{1} \frac{\nu+3}{3 \cdot 2\nu+3 \cdot \nu+2 \cdot \nu+3 \dots \nu+s+2} \\ &+ \binom{s}{2} \frac{\nu+5}{5 \cdot 2\nu+5 \cdot \nu+3 \cdot \nu+4 \dots \nu+s+3} - \dots \end{aligned} \quad (13)$$

We begin by converting

$$\begin{aligned} & \frac{2^{s+1}}{\mu-\nu-1 \cdot \mu-\nu-3 \dots \mu-\nu-2s-1 \cdot \mu+\nu+1 \cdot \mu+\nu+2 \dots \mu+\nu+2s+1} \\ & \text{into partial fractions. It thus takes the form} \\ & \frac{(-1)^s}{2 \cdot 4 \dots 2s} \cdot \frac{1}{\nu+1 \cdot \nu+2 \dots \nu+s+1} \left[\frac{1}{\mu-\nu-1} - \frac{1}{\mu+\nu+1} \right] \\ & - \frac{(-1)^s}{2 \cdot 2 \cdot 4 \dots 2s-2} \frac{1}{\nu+2 \cdot \nu+3 \dots \nu+s+2} \left[\frac{1}{\mu-\nu-3} - \frac{1}{\mu+\nu+3} \right] \\ & + \frac{(-1)^s}{2 \cdot 4 \cdot 2 \cdot 4 \dots 2s-4} \frac{1}{\nu+3 \cdot \nu+4 \dots \nu+s+3} \left[\frac{1}{\mu-\nu-5} - \frac{1}{\mu+\nu+5} \right] \\ & \text{etc.} \end{aligned}$$

Multiply both sides by $2^s \cdot s!$, put $\mu=\nu$, divide by $2(-1)^{s+1}$ and replace $\frac{1}{1 \cdot 3 \dots 2s+1}$ by $\frac{2^s \cdot s!}{2s+1!}$, and the result takes the form (13).

It is worthy of notice that (12) can be readily derived from (13) For

$$\begin{aligned} & \frac{2^{2s} s!}{\mu^2-\nu+1^2 \cdot \mu^2-\nu+3^2 \dots \mu^2-\nu+2s+1^2} = \frac{(-1)^s}{\mu^2-(\nu+1)^2} \cdot \frac{\nu+1}{\nu+1 \dots \nu+s+1} \\ & - \binom{s}{1} \frac{1}{\mu^2-(\nu+3)^2} \frac{\nu+3}{\nu+2 \cdot \nu+3 \dots \nu+s+2} \\ & + \binom{s}{2} \frac{1}{\mu^2-(\nu+5)^2} \frac{\nu+5}{\nu+3 \cdot \nu+4 \dots \nu+s+3} - \dots \end{aligned}$$

The expression on the left-hand treated as a function of μ^2 has the sum of its residues equal to zero.

Hence
$$\frac{\nu+1}{\nu+1 \dots \nu+s+1} - \binom{s}{1} \frac{\nu+3}{\nu+2 \dots \nu+s+2} + \dots = 0$$

Replacing ν by $\nu-1$, this becomes
$$(14)$$

$$\frac{\nu}{\nu \cdot \nu+1 \dots \nu+s} - \binom{s}{1} \frac{\nu+2}{\nu+1 \dots \nu+s+1} + \binom{s}{2} \frac{\nu+4}{\nu+2 \dots \nu+s+2} - \dots = 0$$

The fact should not be overlooked that (14) can equally well be derived from (6) by equating the powers of ρ^s on the two sides of the identity.

Attention may also be called to the curious identity that arises when μ is given the special value 0; viz.

$$\frac{2^{2s} s!}{(\nu+1)^2 (\nu+3)^2 \dots (\nu+2s+1)^2} = \frac{1}{\nu+1} \cdot \frac{1}{\nu+1 \dots \nu+s+1} - \binom{s}{1} \frac{1}{\nu+3} \frac{1}{\nu+2 \dots \nu+s+2} + \binom{s}{2} \frac{1}{\nu+5} \frac{1}{\nu+3 \dots \nu+s+3} - \dots (15)$$

Returning to formula (14) we shall show that it can be readily converted into an identity connecting Gamma functions. When both sides are multiplied by

$$(-1)^s \frac{4}{\sqrt{\pi} \Gamma(\nu+\frac{1}{2}) s!} \left(\frac{x}{2}\right)^{\nu+2s+1},$$

the expression on the right hand side of (14) becomes

$$(-1)^s \frac{1}{\sqrt{\pi} \Gamma(\nu+\frac{1}{2})} \left[\frac{(\nu+1) \Gamma(\nu+1)}{\frac{1}{2} \cdot \nu+\frac{1}{2}} \frac{1}{s! \Gamma(\nu+s+2)} - \frac{(\nu+3) \Gamma(\nu+2)}{1! \cdot \frac{3}{2} \cdot \nu+\frac{3}{2}} \frac{1}{s-1! \Gamma(\nu+s+3)} + \frac{(\nu+5) \Gamma(\nu+3)}{2! \cdot \frac{5}{2} \cdot \nu+\frac{5}{2}} \frac{1}{s-2! \Gamma(\nu+s+4)} - \dots \right] \left(\frac{x}{2}\right)^{\nu+2s+1}$$

This is precisely the general term of

$$\frac{1}{\sqrt{\pi}} \cdot \frac{1}{\Gamma(\nu+\frac{1}{2})} \sum_{s=0}^{\infty} \frac{(-1)^s (\nu+2s+1) \Gamma(\nu+s+1)}{s! s+\frac{1}{2} \cdot \nu+s+\frac{1}{2}} J_{\nu+2s+1}(x)$$

The expression on the left hand side of (14) becomes

$$\begin{aligned} & (-1)^s \frac{4}{\sqrt{\pi}} \cdot 2^{3s} \frac{s!}{2s+1!} \cdot \frac{1}{2^{s+1}} \cdot \frac{1}{\Gamma(\nu+\frac{1}{2})} \frac{1}{\nu+\frac{1}{2} \cdot \nu+\frac{3}{2} \dots \nu+s+\frac{1}{2}} \left(\frac{x}{2}\right)^{\nu+2s+1} \\ &= (-1)^s \frac{2^{2s+1}}{\sqrt{\pi}} \frac{\Gamma(s+1)}{\Gamma(2s+2)} \cdot \frac{1}{\Gamma(\nu+s+\frac{3}{2})} \left(\frac{x}{2}\right)^{\nu+2s+1} \\ &= (-1)^s \frac{2^{2s+1}}{\sqrt{\pi}} \cdot \frac{\sqrt{\pi} 2^{-2s-1}}{\Gamma(s+\frac{3}{2})} \cdot \frac{1}{\Gamma(\nu+s+\frac{3}{2})} \left(\frac{x}{2}\right)^{\nu+2s+1} \\ &= \frac{(-1)^s}{\Gamma(s+\frac{3}{2}) \Gamma(\nu+s+\frac{3}{2})} \left(\frac{x}{2}\right)^{\nu+2s+1} \end{aligned}$$

$$= \text{the general term of the series } Z_{\nu}(x) = \sum_{s=0}^{\infty} \frac{(-1)^s \left(\frac{x}{2}\right)^{\nu+2s+1}}{\Gamma(s+\frac{3}{2}) \Gamma(\nu+s+\frac{3}{2})}.$$

Thus

$$Z_\nu(x) = \frac{1}{\sqrt{\pi} \Gamma(\nu + \frac{1}{2})} \sum_{s=0}^{\infty} \frac{(\nu + 2s + 1) \Gamma(\nu + s + 1)}{s! s + \frac{1}{2} \cdot \nu + s + \frac{1}{2}} J_{\nu+2s+1}(x) \dots \quad (16)$$

The function $Z_\nu(x)$ was introduced by Siemon and studied by him for positive integral values of ν , zero inclusive; it has also been employed by Lord Rayleigh. The formula (16) was proved, subject to the above restrictions, by Siemon, *Programm der Luisenschule*, Berlin, 1890. (N. pp. 54, 292). The proof of the theorem in its general form (by a method which differs totally from that here adopted) was apparently first effected by Nielsen.

§ 7. In the present class of investigations arising from the study of the expansions known as Neumann series of the second kind, the following series

$$1 + 2 \frac{a(a-1)}{(a+1)(a+2)} + 2 \frac{a(a-1)(a-2)(a-3)}{(a+1)(a+2)(a+3)(a+4)} + \dots$$

can be made to play a part of considerable importance. So far as the writer is aware, this series has not hitherto been evaluated. We propose to show that

$$\begin{aligned} 1 + 2 \frac{a(a-1)}{(a+1)(a+2)} + 2 \frac{a(a-1)(a-2)(a-3)}{(a+1)(a+2)(a+3)(a+4)} + \dots \\ = \frac{\sqrt{\pi}}{2} \frac{\Gamma(a+1)}{\Gamma(a+\frac{1}{2})} \dots \end{aligned} \quad (17)$$

We shall assume a to be real and apply Gauss's well-known test for convergence in the case of series where the test-ratio

$$u_{n+1}/u_n = \frac{n^p + an^{p-1} + \dots}{n^p + a'n^{p-1} + \dots}.$$

Such a series is convergent when, and only when, $a' - a < 1$. This test shows that it is necessary and sufficient for the convergence of the series in (17) that a shall be positive.

Multiply both sides of (17) by $\frac{\Gamma(a)}{\Gamma(a+1)}$, and make use of the formula $\Gamma(x) \Gamma(x + \frac{1}{2}) = 2^{-2x+1} \sqrt{\pi} \Gamma(2x)$.

We have to show that

$$\begin{aligned} \frac{\Gamma(a)}{\Gamma(a+1)} \left[1 + 2 \frac{a(a-1)}{(a+1)(a+2)} + 2 \frac{a(a-1)(a-2)(a-3)}{(a+1)(a+2)(a+3)(a+4)} + \dots \right] \\ = 2^{2a-2} \frac{\Gamma(a) \Gamma(a)}{\Gamma(2a)}. \end{aligned}$$

The expression on the left-hand side

$$\begin{aligned} &= \frac{\Gamma(a) \Gamma(1)}{\Gamma(a+1)} + 2 \binom{a}{2} \frac{\Gamma(a) \Gamma(3)}{\Gamma(a+3)} + 2 \binom{a}{4} \frac{\Gamma(a) \Gamma(5)}{\Gamma(a+5)} + \dots \\ &= \int_0^1 (1-t)^{a-1} dt \left[1 + 2 \binom{a}{2} t^2 + 2 \binom{a}{4} t^4 + \dots \right] \end{aligned}$$

$$\begin{aligned}
&= \int_0^1 (1-t)^{a-1} dt \left[-1 + (1+t)^a + (1-t)^a \right] \\
&= -\frac{1}{2a} + \int_0^1 (1-t^2)^{a-1} (1+t) dt \\
&= -\frac{1}{2a} + \int_0^1 (1-t^2)^{a-1} dt + \frac{1}{2a} \\
&= \int_0^1 (1-t^2)^{a-1} dt
\end{aligned}$$

This integral = $\int_0^{\frac{\pi}{2}} \cos^{2a-1} \theta d\theta$, and its value can be found at once

from the formula $\int_0^{\frac{\pi}{2}} \cos^{\nu} \phi d\phi = \frac{\sqrt{\pi}}{2} \frac{\Gamma(\frac{\nu+1}{2})}{\Gamma(\frac{\nu+2}{2})}$, in which the real part of ν is supposed to be greater than -1 . Thus the value of the integral = $\frac{\sqrt{\pi}}{2} \frac{\Gamma(a)}{\Gamma(a+\frac{1}{2})} = 2^{2a-2} \frac{\Gamma(a)}{\Gamma(2a)}$.

It should be observed that the formula (17) bears a close resemblance to two formulae, of which the former at least has played a considerable part in modern analysis:

$$\frac{1}{x-y} = \frac{1}{x} + \sum_{s=1}^{\infty} \frac{y(y+1) \dots (y+s-1)}{x(x+1) \dots (x+s-1)} \quad (\text{Stirling's series})$$

$$\sum_{s=0}^{\infty} \left(\frac{1}{x-y+s} - \frac{1}{x+s} \right) = \sum_{s=1}^{\infty} \frac{1}{s} \cdot \frac{y(y+1) \dots (y+s-1)}{x(x+1) \dots (x+s-1)}$$

(Nielsen, Handbuch der Theorie der Gammafunktion, p. 83.)

When a is a positive integer n , formula (17) becomes

$$\begin{aligned}
1 + 2 \frac{n(n-1)}{(n+1)(n+2)} + 2 \frac{n(n-1)(n-2)(n-3)}{(n+1)(n+2)(n+3)(n+4)} + \dots \\
= 2^{2n-1} \frac{n!n!}{2n!}
\end{aligned} \tag{18}$$

(i) For even values of n an immediate proof is obtained by equating the coefficients of x^{2n} in the formula

$$\cosh 2x + 1 = 2 \cosh^2 x,$$

thus getting

$$\begin{aligned}
\frac{2^{2n}}{2n!} = 2 \left[2 \cdot \frac{1}{2n!} + 2 \frac{1}{2n-2!2!} + 2 \frac{1}{2n-4!4!} + \dots \right. \\
\left. + 2 \frac{1}{n+2!n-2} + \frac{1}{n!n!} \right], \text{ which, on multiplication by } \frac{1}{2}n!n! \text{ converts at once into (18).}
\end{aligned}$$

(ii) For odd values of n the same process must be applied to

$$\cosh 2x - 1 = 2 \sinh^2 x.$$

§ 8. As an illustration of the use to which formula (17) can be put, we shall examine whether there is any formula for $J_{2\nu}(2x)$ analogous to the formula

$$\frac{1}{2} J_{\nu}^2(x) = \sum_{s=1}^{\infty} (-1)^{s-1} J_{\nu+s}(x) J_{\nu-s}(x), \quad (\text{real part of } \nu > 0)$$

a formula which Nielsen singles out as "remarkable" (N. p. 299).

In Schönholzer's formula for the product of two J 's, see (2) § 1, we write $\nu+n$ and $\nu-n$ for ρ . Hence

$$J_{\nu+n}(x) J_{\nu-n}(x) =$$

$$\sum_{s=0}^{\infty} (-1)^s \binom{2\nu+2s}{s} \frac{\nu+s \cdot \nu+s-1 \dots \nu+s-n+1}{\nu+s+1 \cdot \nu+s+2 \dots \nu+s+n} \left(\frac{x}{2}\right)^{2\nu+2s} \frac{1}{\Gamma(\nu+s+1)^2}$$

It follows that

$$\begin{aligned} & 2 J_{\nu+0}(x) J_{\nu-0}(x) + 4 [J_{\nu+2}(x) J_{\nu-2}(x) + J_{\nu+4}(x) J_{\nu-4}(x) \\ & \quad + J_{\nu+6}(x) J_{\nu-6}(x) + \dots] \\ &= 2 \sum_{s=0}^{\infty} (-1)^s \binom{2\nu+2s}{s} \frac{1}{\Gamma(\nu+s+1)^2} \left[1 + 2 \frac{\nu+s \cdot \nu+s-1}{\nu+s+1 \cdot \nu+s+2} \right. \\ & \quad \left. + 2 \frac{\nu+s \cdot \nu+s-1 \cdot \nu+s-2 \cdot \nu+s-3}{\nu+s+1 \cdot \nu+s+2 \cdot \nu+s+3 \cdot \nu+s+4} + \dots \right] \left(\frac{x}{2}\right)^{2\nu+2s} \\ &= 2 \sum_{s=0}^{\infty} (-1)^s \binom{2\nu+2s}{s} \frac{1}{\Gamma(\nu+s+1)^2} \frac{\Gamma(\nu+s)\Gamma(\nu+s+1)}{\Gamma(2\nu+2s)} \frac{x^{2\nu+2s}}{4} \\ &= 2 \sum_{s=0}^{\infty} (-1)^s \frac{\Gamma(2\nu+2s+1)}{\Gamma(2\nu+s+1)\Gamma(s+1)} \cdot \frac{1}{\nu+s} \cdot 2^{2\nu+2s-2} \frac{1}{\Gamma(2\nu+2s)} \left(\frac{x}{2}\right)^{2\nu+2s} \\ &= \sum_{s=0}^{\infty} (-1)^s \frac{x^{2\nu+2s}}{\Gamma(2\nu+s+1)\Gamma(s+1)} = J_{2\nu}(2x) \end{aligned}$$

In the special case $\nu=0$, $J_0(2x)$ must be replaced by $1+J_0(2x)$. This can be verified at once by combining

$$J_0(2x) = J_0^2(x) - 2J_1^2(x) + 2J_2^2(x) - 2J_3^2(x) + \dots$$

with

$$1 = J_0^2(x) + 2J_1^2(x) + 2J_2^2(x) + 2J_3^2(x) + \dots$$

(G. and M. pp. 28, 29).

The formula at which we have thus arrived, namely

$$J_{2\nu}(2x) = 2J_{\nu}^2(x) + 4 \sum_{s=1}^{\infty} J_{\nu+2s}(x) J_{\nu-2s}(x) \quad (19)$$

is clearly constructed after the same pattern as that quoted above for $\frac{1}{2} J_{\nu}^2(x)$.

In the special case where ν is a positive integer n , an independent proof can be based on the equation

$$\begin{aligned} e^{\frac{x}{2}\left(t-\frac{1}{t}\right)} &= J_0(x) + J_1(x)t + J_2(x)t^2 + \dots + J_n(x)t^n + \dots \\ &\quad + J_{-1}(x)\frac{1}{t} + J_{-2}(x)\frac{1}{t^2} + \dots + J_{-n}(x)\frac{1}{t^n} + \dots \end{aligned}$$

(i) Let n be an even positive integer.

We have

$$\begin{aligned} \left[e^{\frac{x}{2}\left(t-\frac{1}{t}\right)} + e^{-\frac{x}{2}\left(t-\frac{1}{t}\right)} \right]^2 &= 2 + e^{x\left(t-\frac{1}{t}\right)} + e^{-x\left(t-\frac{1}{t}\right)} \\ &= 2 + 2J_0(2x) + 2J_2(2x)t^2 + \dots + 2J_{2n}(2x)t^{2n} + \dots \\ &\quad + 2J_2(2x)t^{-2} + \dots \\ &\quad + 2J_{2n}(2x)t^{-2n} + \dots, \end{aligned}$$

or

$$\begin{aligned} 4[J_0(x) + J_2(x)t^2 + \dots + J_{-2}(x)t^{-2} + \dots]^2 &= 2 + 2J_0(2x) + \dots \\ &\quad + 2J_{2n}(2x)t^{2n} + \dots + 2J_2(2x)t^{-2} + \dots \end{aligned}$$

Equate coefficients of t^{2n} and we find formula (19) with n for ν .

(ii) Let n be an odd positive integer. The same process gives

$$\begin{aligned} J_{2n}(2x) &= 4[J_0J_{2n} + J_2J_{2n-2} + \dots + J_{n-1}J_{n+1}]^2 + 4[J_2J_{2n+2} \\ &\quad + J_4J_{2n+4} + \dots] \end{aligned}$$

Combine this with

$$\begin{aligned} \frac{1}{2}J_n^2(x) &= 4[J_0J_{2n} - J_1J_{2n-1} + J_2J_{2n-2} + \dots + J_{n-1}J_{n+1}] \\ &\quad + 4[J_1J_{2n+1} + J_2J_{2n+2} + J_3J_{2n+3} + \dots], \end{aligned}$$

and we find that

$$\begin{aligned} J_{2n}(2x) &= 2J_n^2 + 4(J_{n+2}J_{n-2} + J_{n+4}J_{n-4} + \dots + J_{2n-1}J_{2n+1}) \\ &\quad - 4(J_1J_{2n+1} + J_3J_{2n+3} + \dots) \\ &= 2J_n^2 + 4(J_{n+2}J_{n-2} + J_{n+4}J_{n-4} + \dots \text{ad inf.}). \end{aligned}$$

§ 9. It is evident that

$$\begin{aligned} 1 &= \frac{1}{t+1} + \left(\frac{t}{t+1} - \frac{t \cdot t-1}{t+1 \cdot t+2} \right) + \left(\frac{t \cdot t-1}{t+1 \cdot t+2} - \frac{t \cdot t-1 \cdot t-2}{t+1 \cdot t+2 \cdot t+3} \right) - \dots \\ &= \frac{1}{t+1} + \frac{3t}{t+1 \cdot t+2} + \frac{5t \cdot t-1}{t+1 \cdot t+2 \cdot t+3} + \frac{7t \cdot t-1 \cdot t-2}{t+1 \cdot t+2 \cdot t+3} + \dots \end{aligned}$$

When both sides are multiplied by $\frac{2t+1!}{t!t!}$ this becomes

$$\binom{2t+1}{t} + 3\binom{2t+1}{t-1} + 5\binom{2t+1}{t-2} + \dots = \frac{2t+1!}{t!t!} \quad (20)$$

Schönholzer's formula shows that

$$J_{s+\frac{1}{2}}^2 = \sum_{t=0}^{\infty} \frac{(-1)^t}{\Gamma(s+t+\frac{3}{2})^2} \binom{2s+2t+1}{t} \left(\frac{x}{2}\right)^{2s+2t+1}$$

Hence

$$\pi \frac{(-1)^t}{\Gamma(t+\frac{3}{2})^2} \cdot \frac{1}{2^{2t+1}} \left[\binom{2t+1}{t} + 3\binom{2t+1}{t-1} + 5\binom{2t+1}{t-2} + \dots \right]$$

is the coefficient of x^{2t+1} in $\pi \sum_{s=0}^{\infty} (-1)^s (2s+1) J_{s+\frac{1}{2}}^2(x)$. But by (20)

this coefficient can be made to take the form

$$\pi \frac{(-1)^t}{\Gamma(t+\frac{3}{2})^2} \cdot \frac{1}{2^{2t+1}} \frac{2t+1!}{t!t!} = \pi \frac{(-1)^t}{2^{2t+1}} \cdot \frac{\Gamma(2t+2)}{[\Gamma(t+1)\Gamma(t+\frac{3}{2})]^2}$$

$$= \pi \frac{(-1)^t}{2^{2t+1}} \frac{2^{4t+2}}{\pi \cdot 2t+1!} = (-1)^t \frac{2^{2t+1}}{2t+1!}$$

= the coefficient of x^{2t+1} in $\sin 2x$.

Thus we have established Lommel's formula (N. p. 281)

$$\sin 2x = \pi \sum_{s=0}^{\infty} (-1)^s (2s+1) J_{s+\frac{1}{2}}^2(x) \dots \quad (21)$$

Lommel's proof of this equation, as he gives it in vol. 2 of the *Mathematische Annalen*, pp. 632, 3, is made to depend upon the equation

$$J_{\nu-1}^2 = \frac{2}{x} \frac{d}{dx} \sum_{s=0}^{\infty} (\nu+2s) J_{\nu+2s}^2$$

He appears to have overlooked a still simpler proof, which has the advantage of giving the value of the remainder after a finite number of terms. Observe that by multiplying the equations

$$J_{\frac{3}{2}} + J_{-\frac{1}{2}} = \frac{1}{x} J_{\frac{1}{2}}$$

$$J_{\frac{5}{2}} + J_{-\frac{3}{2}} = \frac{3}{x} J_{\frac{3}{2}}$$

$$J_{\frac{7}{2}} + J_{-\frac{5}{2}} = \frac{5}{x} J_{\frac{5}{2}}$$

...

by $J_{\frac{1}{2}}, -J_{\frac{3}{2}}, J_{\frac{5}{2}}$, etc., and then adding the results, we get

$$J_{\frac{1}{2}} J_{-\frac{1}{2}} \left[= \frac{\sin 2x}{\pi x} \right] = \frac{1}{x} \left[J_{\frac{1}{2}}^2 - 3 J_{\frac{3}{2}}^2 + 5 J_{\frac{5}{2}}^2 - \dots \right]$$

§ 10. By equating the coefficients of x^s in the expansions of $(1+x)^{2s-1}$ and in $(1+x)^{2s} (1+x)^{-1}$, we find that

$$\binom{2s}{s} - 2 \binom{2s}{s-1} + 2 \binom{2s}{s-2} - \dots = 0 \quad (22)$$

Hence

$$\sum_{s=1}^{\infty} \frac{(-1)^s}{\Gamma(s+\frac{1}{2})\Gamma(s+\frac{3}{2})} \left[\binom{2s}{s} - 2 \binom{2s}{s-1} + 2 \binom{2s}{s-2} - \dots \right] \left(\frac{x}{2} \right)^{2s} = 0.$$

The formula (2) shows that these are all the terms containing x in the expansion according to powers of x of

$$J_{-\frac{1}{2}} J_{\frac{1}{2}} + 2 J_{\frac{1}{2}} J_{\frac{3}{2}} + 2 J_{\frac{3}{2}} J_{\frac{5}{2}} + \dots$$

There is only one term independent of x , namely the constant term of

$$J_{-\frac{1}{2}} J_{\frac{1}{2}}, \text{ and its value is } \frac{1}{\Gamma(\frac{1}{2})\Gamma(\frac{3}{2})} = \frac{2}{\pi}.$$

Thus we have a very elementary proof for the elegant formula

$$\frac{2}{\pi} = J_{-\frac{1}{2}} J_{\frac{1}{2}} + 2J_{\frac{1}{2}} J_{\frac{3}{2}} + 2J_{\frac{3}{2}} J_{\frac{5}{2}} + \dots \quad (23)$$

Another proof will be found in N. p. 295.

It is instructive to show that the formula (23) can be connected with two others, due to Lommel, namely

$$S_i(2x) = J_{\frac{1}{2}}^2 + J_{\frac{3}{2}}^2 + J_{\frac{5}{2}}^2 + \dots \quad (\text{N. p. 293}) \quad (24)$$

where $S_i(x)$ is the integral sine function $\int_0^x \frac{\sin x}{x} dx$, and

$$\frac{2x}{\pi} = J_{\frac{1}{2}}^2 + 3J_{\frac{3}{2}}^2 + 5J_{\frac{5}{2}}^2 + \dots \quad (25)$$

(see N. p. 295 for the generalized form of this equation (25).).

The formula (24), on differentiation, gives

$$2J_{\frac{1}{2}} J'_{\frac{1}{2}} + 2J_{\frac{3}{2}} J'_{\frac{3}{2}} + 2J_{\frac{5}{2}} J'_{\frac{5}{2}} + \dots = \frac{\sin 2x}{\pi x};$$

hence

$$\begin{aligned} J_{\frac{1}{2}} \left(\frac{1}{x} J_{\frac{1}{2}} - 2J_{\frac{3}{2}} \right) + J_{\frac{3}{2}} \left(\frac{3}{x} J_{\frac{3}{2}} - 2J_{\frac{5}{2}} \right) + J_{\frac{5}{2}} \left(\frac{5}{x} J_{\frac{5}{2}} - 2J_{\frac{7}{2}} \right) + \dots \\ = \frac{\sin 2x}{\pi x} \end{aligned}$$

But $\frac{1}{x} (J_{\frac{1}{2}}^2 + 3J_{\frac{3}{2}}^2 + 5J_{\frac{5}{2}}^2 + \dots) = \frac{2}{\pi}$ and $\frac{\sin 2x}{\pi x} = J_{\frac{1}{2}} J_{-\frac{1}{2}}$; therefore

we have $J_{-\frac{1}{2}} J_{\frac{1}{2}} + 2J_{\frac{1}{2}} J_{\frac{3}{2}} + 2J_{\frac{3}{2}} J_{\frac{5}{2}} + \dots = \frac{2}{\pi}$,

as above in (23).

Without performing the analysis it may be worth while to point out that (24) can be proved at once by combining (2) with the identity

$$\binom{2s+1}{s} - \binom{2s+1}{s-1} + \binom{2s+1}{s-2} - \dots = \binom{2s}{s} \quad (26)$$

The following is an instructive proof of (25):

$$J_{\frac{1}{2}}^2 = \frac{2}{\pi} \int_0^{\frac{\pi}{2}} J_1(2x \cos \phi) d\phi,$$

$$J_{\frac{3}{2}}^2 = \frac{2}{\pi} \int_0^{\frac{\pi}{2}} J_3(2x \cos \phi) d\phi,$$

$$J_{\frac{5}{2}}^2 = \frac{2}{\pi} \int_0^{\frac{\pi}{2}} J_5(2x \cos \phi) d\phi, \text{ etc.}$$

But $J_1(x) + 3J_3(x) + 5J_5(x) + \dots = \frac{x}{2}$ (G. and M. p. 19);

therefore

$$J_{\frac{1}{2}}^2 + 3J_{\frac{3}{2}}^2 + 5J_{\frac{5}{2}}^2 + \dots = \frac{2}{\pi} \int_0^{\frac{\pi}{2}} x \cos \phi d\phi = \frac{2x}{\pi}.$$

§ 11. As reference has been made in § 10 to the integral sine function, it may not be out of place here to correct a misprint in the formula (3) for $S_i(2x)$. (N. p. 295). The numerator 8 should be 4. The corrected formula

$$S_i(2x) = \pi x \left[J_{\frac{1}{2}} J_{-\frac{1}{2}} + \sum_{s=0}^{\infty} \frac{4s}{4s^2-1} J_{s+\frac{1}{2}} J_{s-\frac{1}{2}} \right] \quad (27)$$

can be made to depend at once upon the formulae of § 10.

Replacing $\frac{4s}{4s^2-1}$ by $\frac{1}{2} \left(\frac{1}{s-\frac{1}{2}} + \frac{1}{s+\frac{1}{2}} \right)$, the expression on the right hand side of (27) can be written

$$\begin{aligned} & \pi x \left[J_{\frac{1}{2}} (J_{-\frac{1}{2}} + J_{\frac{3}{2}}) + \frac{1}{3} J_{\frac{3}{2}} (J_{\frac{1}{2}} + J_{\frac{5}{2}}) + \frac{1}{5} J_{\frac{5}{2}} (J_{\frac{3}{2}} + J_{\frac{7}{2}}) + \dots \right] \\ &= \pi x \left[J_{\frac{1}{2}} \cdot \frac{1}{x} J_{\frac{1}{2}} + \frac{1}{3} J_{\frac{3}{2}} \cdot \frac{3}{x} J_{\frac{3}{2}} + \frac{1}{5} J_{\frac{5}{2}} \cdot \frac{5}{x} J_{\frac{5}{2}} + \dots \right] \\ &= \pi \left[J_{\frac{1}{2}}^2 + J_{\frac{3}{2}}^2 + J_{\frac{5}{2}}^2 + J_{\frac{7}{2}}^2 + \dots \right] = S_i(2x) \end{aligned}$$

Thus (27) is a disguised form of (24).

§ 12. The identity

$$\binom{2s+1}{s} + \binom{2s+1}{s-1} + \binom{2s+1}{s-2} + \dots = 2^{2s} \quad (28)$$

shows that

$$\begin{aligned} J_{\frac{1}{2}}^2 - J_{\frac{3}{2}}^2 + J_{\frac{5}{2}}^2 - \dots &= \sum_{s=0}^{\infty} \frac{(-1)^s}{\Gamma(s+\frac{3}{2})^2} \left[\binom{2s+1}{s} + \binom{2s+1}{s-1} \right. \\ &\quad \left. + \binom{2s+1}{s-2} + \dots \right] \left(\frac{x}{2} \right)^{2s+1} \\ &= \frac{1}{2} \sum_{s=0}^{\infty} \frac{(-1)^s}{\Gamma(s+\frac{3}{2})^2} x^{2s+1} \\ &= \frac{1}{2} Z_0(2x) \end{aligned} \quad (29)$$

where $Z_\nu(x)$ is Siemon's function, defined in § 6.

Another expansion for $Z_0(2x)$ can be derived from the formula

$$\begin{aligned} Z_0(2x) &= \frac{2}{\pi} \int_0^{\frac{\pi}{2}} \sin(2x \cos \phi) d\phi \\ &= \frac{2}{\pi} \int_0^{\frac{\pi}{2}} \sin(2x \sin \phi) d\phi \\ &= \frac{4}{\pi} \int_0^{\frac{\pi}{2}} [J_1(2x) \sin \phi + J_3(2x) \sin 3\phi + \dots] d\phi \\ &= \frac{4}{\pi} [J_1(2x) + \frac{1}{3} J_3(2x) + \frac{1}{5} J_5(2x) + \dots] \end{aligned} \quad (30)$$

§ 13. The series $J_\nu^2 + J_{\nu+1}^2 + J_{\nu+2}^2 + \dots$ is suggested as a generalization of the series in formula (24).

The expression

$$\binom{2\nu+2s}{s} - \binom{2\nu+2s}{s-1} + \binom{2\nu+2s}{s-2} - \dots = \binom{2\nu+2s-1}{s} \quad (31)$$

For the left hand member

$$= \binom{2\nu+2s}{s} \left[1 - \frac{s}{2\nu+s+1} + \frac{s \cdot s-1}{2\nu+s+1 \cdot 2\nu+s+2} - \dots \right]$$

$$= \binom{2\nu+2s}{s} \frac{2\nu+s}{2\nu+2s} = \binom{2\nu+2s-1}{s};$$

$$\text{hence the } J\text{-series} = \sum_{s=0}^{\infty} \frac{(-1)^s}{\Gamma(\nu+s+1)^2} \binom{2\nu+2s}{s} \left[1 - \frac{s}{2\nu+s+1} + \frac{s \cdot s-1}{2\nu+s+1 \cdot 2\nu+s+2} - \dots \right] \left(\frac{x}{2}\right)^{2\nu+2s}$$

$$\text{Thus } J_\nu^2 + J_{\nu+1}^2 + J_{\nu+2}^2 + \dots = \sum_{s=0}^{\infty} \frac{(-1)^s}{\Gamma(\nu+s+1)^2} \binom{2\nu+2s-1}{s} \left(\frac{x}{2}\right)^{2\nu+2s} \quad (32)$$

A similar method founded on the identity

$$\begin{aligned} \nu \binom{2\nu+2s}{s} - (\nu+1) \binom{2\nu+2s}{s-1} + (\nu+2) \binom{2\nu+2s}{s-2} - \dots \\ = \binom{2\nu+2s-2}{s-1} \frac{(\nu+s)(2\nu-1)}{s} \end{aligned} \quad (33)$$

where $s \geq 1$, shows that

$$\begin{aligned} \nu J_\nu^2 + (\nu+1) J_{\nu+1}^2 + (\nu+2) J_{\nu+2}^2 + \dots = \frac{\nu}{\Gamma(\nu+1)^2} \left(\frac{x}{2}\right)^{2\nu} \\ + (2\nu-1) \sum_{s=1}^{\infty} \frac{(-1)^s}{\Gamma(\nu+s+1)^2} \binom{2\nu+2s-2}{s-1} \frac{\nu+s}{s} \left(\frac{x}{2}\right)^{2\nu+2s} \end{aligned} \quad (34)$$

The presence of the factor $2\nu-1$ accounts for the simplicity of the formula (25), for when $\nu = \frac{1}{2}$, all terms after the first on the right hand side of (34) drop out.

§ 14. Remembering that $1/\Gamma(x)$ is a transcendental integral function, it follows that the poles of

$$\frac{\Gamma(\nu) \Gamma(1-\nu)}{\Gamma\left(\frac{\mu+\nu}{2}\right) \Gamma\left(\frac{\mu-\nu}{2}\right)}, = \frac{\pi}{\sin \nu\pi} \cdot \frac{1}{\Gamma\left(\frac{\mu+\nu}{2}\right) \Gamma\left(\frac{\mu-\nu}{2}\right)}$$

considered as a function of ν are the points $\nu=0, \pm 1, \pm 2, \dots$. Also the poles are simple. Hence, putting

$$\frac{\Gamma(\nu) \Gamma(1-\nu)}{\Gamma\left(\frac{\mu+\nu}{2}\right) \Gamma\left(\frac{\mu-\nu}{2}\right)} = \frac{A_0}{\nu} + \left(\frac{A_1}{\nu+1} + \frac{B_1}{\nu-1}\right) + \left(\frac{A_2}{\nu+2} + \frac{B_2}{\nu-2}\right) + \dots,$$

and evaluating the residues A_0, A_1, B_1, \dots by the ordinary method of partial fractions, we find that

$$A_0 = \frac{1}{\Gamma\left(\frac{\mu}{2}\right)^2}; A_1 = B_1 = \frac{-1}{\Gamma\left(\frac{\mu+1}{2}\right)\Gamma\left(\frac{\mu-1}{2}\right)}; A_2 = B_2 \\ = \frac{1}{\Gamma\left(\frac{\mu+2}{2}\right)\Gamma\left(\frac{\mu-2}{2}\right)}; \dots$$

Thus

$$\frac{\Gamma(1+\nu)\Gamma(1-\nu)}{\Gamma\left(\frac{\mu+\nu}{2}\right)\Gamma\left(\frac{\mu-\nu}{2}\right)} = \frac{1}{\Gamma\left(\frac{\mu}{2}\right)^2} - \frac{2\nu^2}{\nu^2-1^2} \frac{1}{\Gamma\left(\frac{\mu+1}{2}\right)\Gamma\left(\frac{\mu-1}{2}\right)} \\ + \frac{2\nu^2}{\nu^2-2^2} \frac{1}{\Gamma\left(\frac{\mu+2}{2}\right)\Gamma\left(\frac{\mu-2}{2}\right)} + \dots \quad (35)$$

If we replace μ by $n+2s+2$, we see that the factor containing Gamma functions in the general term

$$(-1)^s \frac{1}{\Gamma\left(\frac{n+\nu}{2}+s+1\right)\Gamma\left(\frac{n-\nu}{2}+s+1\right)} \binom{n+2s}{s} \left(\frac{x}{2}\right)^{n+2s} \text{ of}$$

$\frac{J_{\frac{n+\nu}{2}} J_{\frac{n-\nu}{2}}}{\Gamma(\nu)\Gamma(1-\nu)}$ can be replaced by

$$\frac{1}{\Gamma(\nu)\Gamma(1-\nu)} \left[\frac{1}{\Gamma\left(\frac{n}{2}+s+1\right)^2} - \frac{2\nu^2}{\nu^2-1^2} \frac{1}{\Gamma\left(\frac{n+1}{2}+s+1\right)\Gamma\left(\frac{n-1}{2}+s+1\right)} \right. \\ \left. + \frac{2\nu^2}{\nu^2-2^2} \frac{1}{\Gamma\left(\frac{n+2}{2}+s+1\right)\Gamma\left(\frac{n-2}{2}+s+1\right)} \dots \right]$$

The terms in $\frac{2\nu^2}{\nu^2-t^2}$ furnish a series = the product of $\frac{\sin \nu\pi}{\pi}$ by

$$(-1)^t \frac{2\nu^2}{\nu^2-t^2} \sum_{s=0}^{\infty} \frac{1}{\Gamma\left(\frac{n+t}{2}+s+1\right)\Gamma\left(\frac{n-t}{2}+s+1\right)} \binom{n+2s}{s} \left(\frac{x}{2}\right)^{n+2s} \\ = \frac{\sin \nu\pi}{\nu\pi} (-1)^t \frac{2\nu^2}{\nu^2-t^2} \frac{J_{\frac{n+t}{2}} J_{\frac{n-t}{2}}}{\Gamma\left(\frac{n+t}{2}\right)\Gamma\left(\frac{n-t}{2}\right)}$$

Hence adding all the terms obtained by putting t successively = 0, 1, 2, 3, ..., and replacing t by s ,

we find that

$$\frac{\pi}{\sin \nu \pi} \frac{J_{\frac{n+\nu}{2}} J_{\frac{n-\nu}{2}}}{J_{\frac{n}{2}}} = J_{\frac{n}{2}}^2 + 2\nu^2 \sum_{s=1}^{\infty} \frac{(-1)^s}{\nu^2 - s^2} J_{\frac{n+s}{2}} J_{\frac{n-s}{2}}, \dots \quad (36)$$

a result given in N. p. 68, but proved in an entirely different manner.

If we start with $\frac{\Gamma\left(\frac{\nu}{2}\right) \Gamma\left(1 - \frac{\nu}{2}\right)}{\Gamma\left(\frac{\mu+\nu}{2}\right) \Gamma\left(\frac{\mu-\nu}{2}\right)}$, with simple poles at

$\nu=0, \mp 2, \mp 4, \dots$, and apply the same method as that just used, we find that

$$\frac{J_{\frac{n+\nu}{2}} J_{\frac{n-\nu}{2}}}{J_{\frac{n}{2}}} = \frac{2 \sin \frac{\nu \pi}{2}}{\nu \pi} \left[J_{\frac{n}{2}}^2 + 2\nu^2 \sum_{s=1}^{\infty} \frac{(-1)^s}{\nu^2 - 4s^2} J_{\frac{n}{2}+s} J_{\frac{n}{2}-s} \right] \dots \quad (37)$$

(N. p. 68, (26); the factor $(-1)^s$ here inserted has been accidentally omitted in Nielsen's book). The method by which Nielsen arrives at (36), (37) leads him to describe (37) as a very peculiar expansion when compared with the expansion (36). Our method has the advantage of showing that the two expansions are naturally and simply related.

§ 15. The special case of (37) furnished by putting $\nu=1$, $n=0$, namely

$$\sin 2x = 2x J_0^2 + 4x \sum_{s=1}^{\infty} \frac{1}{1-4s^2} J_s^2 \quad (38)$$

can be made to lead to a companion formula for $1 - \cos 2x$.

Write (38) in the form

$$\sin 2x = 2x \left[(J_0^2 - J_1^2) + \frac{1}{3} (J_1^2 - J_2^2) + \frac{1}{5} (J_2^2 - J_3^2) + \dots \right]$$

and let ν denote the expression within square brackets.

It is easy to prove that

$$\int_0^x x (J_{\nu-1}^2 - J_{\nu}^2) = x J_{\nu-1} J_{\nu} \quad (\text{real part of } \nu > 0) \quad (39)$$

For $D_x (x J_{\nu-1} J_{\nu}) = J_{\nu-1} J_{\nu} + x J_{\nu-1}^1 J_{\nu} + x J_{\nu-1} J_{\nu}^1$

$$= J_{\nu-1} J_{\nu} + x \left(\frac{\nu-1}{x} J_{\nu-1} - J_{\nu} \right) J_{\nu}$$

$$+ x J_{\nu-1} \left(-\frac{\nu}{x} J_{\nu} + J_{\nu-1} \right)$$

$$= x (J_{\nu-1}^2 - J_{\nu}^2).$$

Integrating both sides of (38) we infer that

$$\int_0^x x \nu dx = x \left[J_0 J_1 + \frac{1}{3} J_1 J_2 + \frac{1}{5} J_2 J_3 + \dots \right]$$

The general term of $J_0 J_1 + \frac{1}{3} J_1 J_2 + \frac{1}{5} J_2 J_3 + \dots$

$$= \frac{(-1)^s}{\Gamma(s+1) \Gamma(s+2)} \left[\binom{2s+1}{s} - \frac{1}{3} \binom{2s+1}{s-1} + \frac{1}{5} \binom{2s+1}{s-2} - \dots \right] 2 \left(\frac{x}{2} \right)^{2s+2}$$

But

$$\binom{2s+1}{s} - \frac{1}{3} \binom{2s+1}{s-1} + \frac{1}{5} \binom{2s+1}{s-2} - \dots = 2^{4s+1} \frac{s! s+1!}{2s+2!} \quad (40)$$

Hence the general term simplifies to $(-1)^s 2^{2s} \frac{x^{2s+2}}{2s+2!} =$ the general term of $\frac{1-\cos 2x}{4}$. It follows that

$$\int_0^x x v dx = \frac{1-\cos 2x}{4}; \text{ therefore } v = \frac{\sin 2x}{2}$$

This proof associates, then, with the formula (38) the companion formula

$$\frac{1-\cos 2x}{4x} = J_0 J_1 + \frac{1}{3} J_1 J_2 + \frac{1}{5} J_2 J_3 + \dots \quad (41)$$

§ 16. This formula (41) leads fairly directly, as we shall show, to a formula described by Nielsen as "remarkable", namely

$$\frac{\sin^2 x}{x} = \int_0^{\frac{\pi}{2}} \Omega_0(2x \sin \phi) \sin \phi d\phi \quad (42)$$

(N. p. 65), where $\Omega_\nu(x)$ is the function $\frac{1}{\pi} \int_0^\pi \sin(x \sin \phi - \nu \phi) d\phi$ in-

roduced almost simultaneously by Lommel and H. F. Weber of Zurich (N. p. 48). For this purpose we start with the formula (N. p. 67)

$$\Omega_{2n}(x) = \frac{4}{\pi} \sum_{s=0}^{\infty} \frac{2s+1}{(2s+1)^2 - 4n^2} J_{2s+1}(x),$$

which implies

$$\Omega_0(x) = \frac{4}{\pi} \sum_{s=0}^{\infty} \frac{1}{2s+1} J_{2s+1}(x).$$

Now by (41)

$$\begin{aligned} \frac{\sin^2 x}{x} &= 2 (J_0 J_1 + \frac{1}{3} J_1 J_2 + \frac{1}{5} J_2 J_3 + \dots) \\ &= \frac{4}{\pi} \sum_{s=0}^{\infty} \frac{1}{2s+1} \frac{\pi}{2} J_s J_{s+1} \\ &= \frac{4}{\pi} \sum_{s=0}^{\infty} \frac{1}{2s+1} \int_0^{\frac{\pi}{2}} J_{2s+1}(2x \sin \phi) \sin \phi d\phi \\ &= \int_0^{\frac{\pi}{2}} \Omega_0(2x \sin \phi) \sin \phi d\phi. \end{aligned}$$

§ 17. The formula (37) gives as special cases

$$\begin{aligned} \frac{J_{n+1}}{2} \frac{J_{n-1}}{2} &= \frac{2}{\pi} \left[J_{\frac{n}{2}}^2 + 2 \sum \frac{(-1)^s}{1^2 - 4s^2} J_{\frac{n}{2}+s} J_{\frac{n}{2}-s} \right] \\ \frac{J_{n+3}}{2} \frac{J_{n-3}}{2} &= \frac{-2}{\pi} \left[\frac{1}{3} J_{\frac{n}{2}}^2 + 2 \cdot 3 \sum \frac{(-1)^s}{3^2 - 4s^2} J_{\frac{n}{2}+s} J_{\frac{n}{2}-s} \right] \\ \frac{J_{n+5}}{2} \frac{J_{n-5}}{2} &= \frac{2}{\pi} \left[\frac{1}{5} J_{\frac{n}{2}}^2 + 2 \cdot 5 \sum \frac{(-1)^s}{5^2 - 4s^2} J_{\frac{n}{2}+s} J_{\frac{n}{2}-s} \right] \end{aligned}$$

When we add by columns we find that

$$\begin{aligned} \frac{J_{n+1}}{2} \frac{J_{n-1}}{2} + \frac{J_{n+3}}{2} \frac{J_{n-3}}{2} + \dots &= \frac{2}{\pi} \cdot \frac{\pi}{4} J_{\frac{n}{2}}^2 \\ &+ \frac{2}{\pi} \cdot 2 \cdot (-1)^s \cdot \frac{\pi}{4} \sec s\pi \cdot J_{\frac{n}{2}+s} J_{\frac{n}{2}-s} = \frac{1}{2} J_{\frac{n}{2}}^2 + J_{\frac{n}{2}+s} J_{\frac{n}{2}-s} \end{aligned}$$

Thus we have arrived at an apparently new formula for $J_{\frac{n}{2}}^2$, namely

$$J_{\frac{n}{2}}^2 = 2 \left[\frac{J_{n+1}}{2} \frac{J_{n-1}}{2} - \frac{J_{n+2}}{2} \frac{J_{n-2}}{2} + \frac{J_{n+3}}{2} \frac{J_{n-3}}{2} - \frac{J_{n+4}}{2} \frac{J_{n-4}}{2} \dots \right] \quad (43)$$

The special case which arises when $n=0$ is deserving of note. In the first place

$$J_0^2 = 2 \left(J_{\frac{1}{2}} J_{-\frac{1}{2}} + J_{\frac{3}{2}} J_{-\frac{3}{2}} + J_{\frac{5}{2}} J_{-\frac{5}{2}} + \dots \right) + 2 (J_1^2 - J_2^2 + J_3^2 - \dots)$$

This can be simplified by using the formulae (G. and M. p. 28)

$$\begin{aligned} 1 &= J_0^2 + 2 J_1^2 + 2 J_2^2 + \dots \\ J_0(2x) &= J_0^2 - 2 J_1^2 + 2 J_2^2 - \dots \end{aligned}$$

It then becomes

$$J_0(2x) = 2 \left[J_{\frac{1}{2}} J_{-\frac{1}{2}} + J_{\frac{3}{2}} J_{-\frac{3}{2}} + J_{\frac{5}{2}} J_{-\frac{5}{2}} + \dots \right] \quad (44)$$

As regards external appearance this bears a considerable resemblance to the formula (24) for the integral sine function.

When (43) is compared with the theorem quoted at the beginning of § 8, we see that

$$\left. \begin{aligned} &\frac{J_{n+1}}{2} \frac{J_{n-1}}{2} + \frac{J_{n+3}}{2} \frac{J_{n-3}}{2} + \dots \\ \text{and} \quad &2 \left[\frac{J_{n+1}}{2+1} \frac{J_{n-1}}{2-1} + \frac{J_{n+3}}{2+3} \frac{J_{n-3}}{2-3} + \dots \right] \end{aligned} \right\} \quad (45)$$

have the same sum

§ 18. We shall next establish a companion formula to (19) in § 8 for $J_{2\nu}(2x)$, namely

$$J_{2\nu}(2x) = 4 (J_{\nu-1} J_{\nu+1} + J_{\nu-3} J_{\nu+3} + \dots) \quad (46)$$

On the right-hand side the general term is

$$\begin{aligned} 4(-1)^s &\frac{1}{\Gamma_1(\nu+s) \Gamma(\nu+s+2)} \left[1 + \frac{\nu+s-2 \cdot \nu+s-1}{\nu+s+2 \cdot \nu+s+3} \right. \\ &\left. + \frac{\nu+s-2 \cdot \nu+s-1 \cdot \nu+s \cdot \nu+s+1}{\nu+s+2 \cdot \nu+s+3 \cdot \nu+s+4 \cdot \nu+s+5} + \dots \right] \binom{2\nu+2s}{s} \left(\frac{x}{2} \right)^{2\nu+2s} \end{aligned}$$

On the left-hand side the general term is

$$(-1)^s \frac{1}{\Gamma(s+1) \Gamma(2\nu+s+1)} x^{2\nu+2s}$$

Hence we have to prove that the expression in square brackets has the value

$$\frac{\Gamma(\nu+s) \Gamma(\nu+s+2)}{\Gamma(2\nu+2s+1)} 2^{2\nu+2s-2}$$

Replace $\nu+s$ by μ ; we have to verify that

$$1 + \frac{\mu-1 \cdot \mu-2}{\mu+2 \cdot \mu+3} + \frac{\mu-1 \cdot \mu-2 \cdot \mu-3 \cdot \mu-4}{\mu+2 \cdot \mu+3 \cdot \mu+4 \cdot \mu+5} + \dots = 2^{2\mu-2} \frac{\Gamma(\mu) \Gamma(\mu+2)}{\Gamma(2\mu+1)};$$

i.e., that

$$\begin{aligned} \frac{\mu}{\mu+1} + \frac{\mu \cdot \mu-1 \cdot \mu-2}{\mu+1 \cdot \mu+2 \cdot \mu+3} + \frac{\mu \cdot \mu-1 \cdot \mu-2 \cdot \mu-3 \cdot \mu-4}{\mu+1 \cdot \mu+2 \cdot \mu+3 \cdot \mu+4 \cdot \mu+5} + \dots \\ = 2^{2\mu-2} \frac{\Gamma(\mu+1)^2}{\Gamma(2\mu+1)}. \end{aligned}$$

We have

$$(i) \quad F(-\mu, 1, \mu+1, 1) = \frac{\Gamma(\mu+1) \Gamma(2\mu)}{\Gamma(2\mu+1) \Gamma(\mu)} = \frac{1}{2};$$

$$(ii) \quad F(-\mu, 1, \mu+1, 1) = 1 - \frac{\mu}{\mu+1} + \frac{\mu \cdot \mu-1}{\mu+1 \cdot \mu+2} - \frac{\mu \cdot \mu-1 \cdot \mu-2}{\mu+1 \cdot \mu+2 \cdot \mu+3} + \dots$$

$$(iii) \quad 2^{2\mu-2} \frac{\Gamma(\mu) \Gamma(\mu+1)}{\Gamma(2\mu)} = 1 + \frac{2\mu \cdot \mu-1}{\mu+1 \cdot \mu+2} + 2 \frac{\mu \cdot \mu-1 \cdot \mu-2 \cdot \mu-3}{\mu+1 \cdot \mu+2 \cdot \mu+3 \cdot \mu+4} + \dots$$

(by formula (17) of § 7).

Hence

$$\begin{aligned} \frac{\mu}{\mu+1} + \frac{\mu \cdot \mu-1 \cdot \mu-2}{\mu+1 \cdot \mu+2 \cdot \mu+3} + \dots &= 2^{2\mu-3} \frac{\Gamma(\mu) \Gamma(\mu+1)}{\Gamma(2\mu)} \\ &= 2^{2\mu-2} \frac{\Gamma(\mu+1)^2}{\Gamma(2\mu+1)} \end{aligned}$$

This establishes formula (46), viz.

$$J_{2\nu}(2x) = 4 \sum_{s=1}^{\infty} J_{\nu+2s+1} J_{\nu-2s+1}$$

The formula appears to be new. Its close resemblance to

$$\frac{1}{2} J_{2\nu}^2(x) = \sum_{s=1}^{\infty} (-1)^{s-1} J_{\nu+s}(x) J_{\nu-s}(x),$$

a formula characterized by Nielsen p. 299 as remarkable, should be noted.

If we put $\nu = \frac{1}{2}$, we derive the elegant special result

$$J_1(2x) = 4 \left[J_{-\frac{1}{2}} J_{\frac{3}{2}} + J_{-\frac{5}{2}} J_{\frac{7}{2}} + J_{-\frac{9}{2}} J_{\frac{11}{2}} + \dots \right] \quad (47)$$

The property to which attention was called at the end of § 17 shows that (46) can be converted into

$$J_{2\nu}(2x) = 2 \left[J_{\nu+\frac{1}{2}} J_{\nu-\frac{1}{2}} + J_{\nu+\frac{3}{2}} J_{\nu-\frac{3}{2}} + \dots \right] \quad (48)$$

This may be regarded as the generalization of (44), viz.

$$J_0(2x) = 2 \left[J_{\frac{1}{2}} J_{-\frac{1}{2}} + J_{\frac{3}{2}} J_{-\frac{3}{2}} + \dots \right],$$

and of

$$J_1(2x) = 2 [J_0 J_1 - J_1 J_2 + J_2 J_3 - \dots],$$

which can be derived at once from the special formula for $J_1 \left(2b \cos \frac{a}{2} \right)$, given by G. and M. p. 29, by putting $b=x$, $a=0$.

§ 19. The expansions

$$\left(\frac{1+x}{1-x} \right)^{2\nu+1} = 1 + (4\nu+2)x + 2(2\nu+1)^2 x^2 + \left[\frac{4}{3} (2\nu+1)^3 \right. \quad (\text{i.})$$

$$\left. + \frac{2}{3} (2\nu+1) \right] x^3 + \left[\frac{2}{3} (2\nu+1)^4 + \frac{4}{3} (2\nu+1)^2 \right] x^4 + \dots$$

$$\left(\frac{1+x}{1-x} \right)^{2\nu+1} (1+x)^2 = 1 + (4\nu+4)x + [8(\nu+1)^2 - 1]x^2 \quad (\text{ii.})$$

$$+ 4 \frac{2\nu+1 \cdot 2\nu+2 \cdot 2\nu+3}{3} x^3 + 2 \frac{2\nu+1 \cdot (2\nu+2)^2 \cdot 2\nu+3}{3} x^4 + \dots$$

$$\left(\frac{1+x}{1-x} \right)^{2\nu+1} (1+x)^4 = 1 + (4\nu+6)x + 8 \cdot \nu+1 \cdot \nu+2 x^2 \quad (\text{iii.})$$

$$+ \frac{2}{3} \cdot 2\nu+1 \cdot 8\nu^2 + 68\nu+39 \cdot x^3 + \dots$$

$$\left(\frac{1+x}{1-x} \right)^{2\nu+1} (1+x)^6 = 1 + (4\nu+8)x + 8 \cdot (\nu+2)^2 - 3 x^2 \quad (\text{iv.})$$

$$+ \frac{32}{3} \cdot \nu+1 \cdot \nu+2 \cdot \nu+3 x^3 + \dots$$

etc.

show that while the coefficients are in general of a complicated character, there is one simple property possessed by specially selected terms in each of them, viz., the coefficient of x^s in

$$\left(\frac{1+x}{1-x} \right)^{2\nu+1} (1+x)^{2s} \text{ is } 2^{2s} \frac{\nu+1 \cdot \nu+2 \dots \nu+s}{s!}$$

To prove this property observe that the coefficient in question is a polynomial in ν of order s . Now this polynomial must vanish for $\nu = -1, -2, \dots, -s$; for $\left(\frac{1+x}{1-x} \right)^{2\nu+1} (1+x)^{2s}$ becomes, for these values,

$(1-x)(1+x)^{2s-1}, (1-x)^3(1+x)^{2s-3}, \dots, (1-x)^{2s-1}(1+x)$, and for each of these expressions the middle term in x^s has a zero coefficient. The literal part of the coefficient under discussion is, therefore, $(\nu+1)(\nu+2)\dots(\nu+s)$. We have still to find the numerical multiplier $2^{2s}/s!$. This can be done by giving ν in

$$\left(\frac{1+x}{1-x} \right)^{2\nu+1} (1+x)^{2s} = \dots + A(\nu+1)(\nu+2)\dots(\nu+s)x^s + \dots$$

the special value $\nu=0$. We thus find that

$$s! \cdot A = \text{coeff. of } x^s \text{ in } \frac{(1+x)^{2s+1}}{1-x} = \binom{2s+1}{s} + \binom{2s+1}{s-1} + \dots = 2^{2s};$$

showing that $A = 2^{2s}/s!$

Let us now replace $\frac{(1+x)^{2\nu+s+1}}{(1-x)^{2\nu+1}}$ by $\frac{(1+x)^{2\nu+2s}}{(1-x)^{2\nu}} + 2x \frac{(1+x)^{2\nu+2s}}{(1-x)^{2\nu+1}}$, and multiply throughout by ν . The coefficient of x^s can be expressed in the alternative form

$$\begin{aligned} & \nu \left[\binom{2\nu+2s}{s} + \binom{2\nu}{1} \binom{2\nu+2s}{s-1} + \binom{2\nu+1}{2} \binom{2\nu+2s}{s-2} + \dots \right] \\ & + 2\nu \left[\binom{2\nu+2s}{s-1} + \binom{2\nu+1}{1} \binom{2\nu+2s}{s-2} + \binom{2\nu+2}{2} \binom{2\nu+2s}{s-3} + \dots \right] \\ & = \nu \binom{2\nu+2s}{s} + (\nu+1) \binom{2\nu+2s}{s-1} + (\nu+2) \binom{2\nu+2s}{s-2} + \dots \end{aligned}$$

Hence

$$\begin{aligned} 2^{2s} \frac{\nu(\nu+1)(\nu+2)\dots(\nu+s)}{s!} &= \nu \binom{2\nu+2s}{s} + (\nu+1) \binom{2\nu}{1} \binom{2\nu+2s}{s-1} \\ &+ (\nu+2) \binom{2\nu+1}{2} \binom{2\nu+2s}{s-2} + \dots \end{aligned} \quad (49)$$

showing that

$$\begin{aligned} \frac{1}{s! \Gamma(\nu+s+1)} &= \frac{\Gamma(\nu)}{\Gamma(\nu+s+1)^2} \cdot \frac{1}{2^{2s}} \left[\nu \binom{2\nu+2s}{s} \right. \\ &\quad \left. + (\nu+1) \binom{2\nu}{1} \binom{2\nu+2s}{s-1} + (\nu+2) \binom{2\nu+1}{2} \binom{2\nu+2s}{s-2} + \dots \right] \end{aligned}$$

If we multiply both sides by $(-1)^s x^{2s}$ and sum from $s=0$ to $s=\infty$, this furnishes us with the formula

$$\begin{aligned} x^\nu J_\nu(2x) &= 2^{2\nu} \Gamma(\nu) \left[\nu J_\nu^2 - (\nu+1) \binom{2\nu}{1} J_{\nu+1}^2 \right. \\ &\quad \left. + (\nu+2) \binom{2\nu+1}{2} J_{\nu+2}^2 + \dots \right] \end{aligned} \quad (50)$$

The expansion (50) is merely a special case of Gegenbauer's generalization of a theorem of Neumann which states that

$$\omega^{-\nu/2} J_\nu(\sqrt{\omega}) = \frac{2^\nu \Gamma(\nu)}{R^\nu r^\nu} \sum_{s=0}^{\infty} (\nu+s) J_{\nu+s}(R) J_{\nu+s}(r) K_{\nu,s}(\cos \theta),$$

where $\omega = R^2 - 2Rr \cos \theta + r^2$ and $K_{\nu,s}(a)$ is defined by

$$(1-2ax+x^2)^{-\nu} = 1 + \sum_{s=1}^{\infty} K_{\nu,s}(a) x^s,$$

(N. p. 280). To see that this is so put $R=r=x$ and $\theta=\pi$, and observe

$$\text{that } K_{\nu,s}(-1) = (-1)^s \frac{2\nu(2\nu+1)\dots(2\nu+s-1)}{s!}$$

McGill University, Montreal,
May, 1916.

*Concerning a Certain Completely Integrable System of Partial
Differential Equations.*

By CHARLES T. SULLIVAN. B.A., M.Sc., Ph.D.

Presented by JAMES HARKNESS, M.A., F.R.S.C.

(Read May Meeting, 1916).

INTRODUCTION.

The completely integrable system of partial differential equations of the second order in two independent variables (u, v) to be discussed in this paper has the form

$$(A) \quad \frac{\partial^2 \theta}{\partial u^2} + \frac{\partial \log \phi}{\partial u} \cdot \frac{\partial \theta}{\partial u} + 2\phi \frac{\partial \theta}{\partial v} = 0,$$

$$\frac{\partial^2 \theta}{\partial v^2} + 2\phi \frac{\partial \theta}{\partial u} + \frac{\partial \log \phi}{\partial v} \cdot \frac{\partial \theta}{\partial v} = 0,$$

where ϕ satisfies the condition equation

$$(1) \quad \frac{\partial^2 \log \phi}{\partial u \partial v} = 4\phi^2.$$

This system of equations, which we shall call the Normal System, arises in connection with many problems in the projective differential geometry of curved surfaces; such problems, for example, as those investigated by Wilczynski in his paper on Directrix Curves (Math. Annalen, Dec. 1914), and problems relating to configurations organically connected with surfaces whose Directrix Quadric consists of a double plane (Sullivan, C. T.; Trans. Am. Math. Soc., Vol. XV, pp. 167-197; Trans. Royal Society of Canada, Vol. IX, Series III, pp. 151-167).

These equations have been developed and their integrals obtained from entirely different points of view in the papers cited above; but the methods of deducing these integrals, though essential to a complete analysis of the configurations involved, are somewhat circuitous.

In this paper it is proposed:

Firstly, to obtain a fundamental set of integrals of the Normal System by a direct analytic procedure.

Secondly, to transform the Normal System in such a way as to show that the integral surfaces of this system are also integral surfaces of the Monge equation

$$(B) \quad \left(\frac{\partial^2 z}{\partial x \partial y} \right)^2 - \left(\frac{\partial^2 z}{\partial x^2} \right) \left(\frac{\partial^2 z}{\partial y^2} \right) = \frac{1}{\lambda^2} \quad (\lambda = \text{a constant})$$

which occurs so frequently in classical works on metrical geometry.

Thirdly, to extend our knowledge concerning the integral surfaces of the Normal System by showing that they can be completely characterized by means of certain metrical properties of the linear complexes which contain their asymptotic curves; and that they may also be considered as the associated surfaces of a certain line congruence whose medial surface is a plane.

The integration of the Normal System.

It is first necessary to show that the Normal System is completely integrable. If, for brevity, we designate the coefficients of (A) by $(2a, 2b; 2a', 2b')$ the system of equations proposed becomes

$$(A') \quad \begin{aligned} \frac{\partial^2 \theta}{\partial u^2} + 2a \frac{\partial \theta}{\partial u} + 2b \frac{\partial \theta}{\partial v} &= 0, \\ \frac{\partial^2 \theta}{\partial v^2} + 2a' \frac{\partial \theta}{\partial u} + 2b' \frac{\partial \theta}{\partial v} &= 0. \end{aligned}$$

By differentiation we find from these the following equations:

$$(2) \quad \begin{aligned} \frac{\partial^3 \theta}{\partial u^3} &= p_1 \frac{\partial^2 \theta}{\partial u \partial v} + p_2 \frac{\partial \theta}{\partial u} + p_3 \frac{\partial \theta}{\partial v}, \\ \frac{\partial^3 \theta}{\partial u^2 \partial v} &= q_1 \frac{\partial^2 \theta}{\partial u \partial v} + q_2 \frac{\partial \theta}{\partial u} + q_3 \frac{\partial \theta}{\partial v}, \\ \frac{\partial^3 \theta}{\partial u \partial v^2} &= r_1 \frac{\partial^2 \theta}{\partial u \partial v} + r_2 \frac{\partial \theta}{\partial u} + r_3 \frac{\partial \theta}{\partial v}, \\ \frac{\partial^3 \theta}{\partial v^3} &= s_1 \frac{\partial^2 \theta}{\partial u \partial v} + s_2 \frac{\partial \theta}{\partial u} + s_3 \frac{\partial \theta}{\partial v}, \end{aligned}$$

where

$$\begin{aligned} p_1 &= -2b, \quad p_2 = 4a^2 - 2 \frac{\partial a}{\partial u}, \quad p_3 = 4ab - 2 \frac{\partial b}{\partial u}, \\ q_1 &= -2a, \quad q_2 = 4a'b - 2 \frac{\partial a}{\partial v}, \quad q_3 = 4bb' - 2 \frac{\partial b}{\partial v}, \\ r_1 &= -2b', \quad r_2 = 4aa' - 2 \frac{\partial a'}{\partial u}, \quad r_3 = 4a'b - 2 \frac{\partial b'}{\partial u}, \\ s_1 &= -2a', \quad s_2 = 4ab' - 2 \frac{\partial a'}{\partial v}, \quad s_3 = 4b'^2 - 2 \frac{\partial b'}{\partial v}. \end{aligned}$$

Now the integrability conditions of (A') will be obtained by writing

$$(3) \quad \begin{aligned} \frac{\partial}{\partial v} \left(\frac{\partial^3 \theta}{\partial u^3} \right) &= \frac{\partial}{\partial u} \left(\frac{\partial^3 \theta}{\partial u^2 \partial v} \right), \\ \frac{\partial}{\partial v} \left(\frac{\partial^3 \theta}{\partial u^2 \partial v} \right) &= \frac{\partial}{\partial u} \left(\frac{\partial^3 \theta}{\partial u \partial v^2} \right), \\ \frac{\partial}{\partial v} \left(\frac{\partial^3 \theta}{\partial u \partial v^2} \right) &= \frac{\partial}{\partial u} \left(\frac{\partial^3 \theta}{\partial v^3} \right). \end{aligned}$$

On developing these equations we find for the first and third:

$$\begin{aligned}
 \frac{\partial}{\partial v} \left(\frac{\partial^3 \theta}{\partial u^3} \right) &= \left(\frac{\partial p_1}{\partial v} + p_1 r_1 + p_2 \right) \frac{\partial^2 \theta}{\partial u \partial v} + \left(p_1 r_2 + \frac{\partial p_2}{\partial v} - 2a' p_3 \right) \frac{\partial \theta}{\partial u} + \\
 &\quad \left(p_1 r_3 + \frac{\partial p_3}{\partial v} - 2b' p_3 \right) \frac{\partial \theta}{\partial v} \\
 &= \left[4 \left(a^2 + \frac{\partial b}{\partial v} \right) - 2 \left(\frac{\partial a}{\partial u} + \frac{\partial b}{\partial v} \right) \right] \frac{\partial^2 \theta}{\partial u \partial v} + \left[4 \frac{\partial}{\partial v} (a'b) + \right. \\
 &\quad \left. 8a \frac{\partial a}{\partial v} - 16aa'b - 2 \frac{\partial^2 a}{\partial u \partial v} \right] \frac{\partial \theta}{\partial u} + \left[4 \frac{\partial}{\partial v} (ab) + \right. \\
 &\quad \left. 4 \frac{\partial}{\partial u} (bb') - 8b(ab' + a'b) - 2 \frac{\partial^2 b}{\partial u \partial v} \right] \frac{\partial \theta}{\partial v} \\
 &= \left(\frac{\partial q_1}{\partial u} + q_1^2 + q_3 \right) \frac{\partial^2 \theta}{\partial u \partial v} + \left(q_1 q_2 + \frac{\partial q_2}{\partial u} - 2a q_2 \right) \frac{\partial \theta}{\partial u} + \\
 &\quad \left(q_1 q_3 + \frac{\partial q_3}{\partial u} - 2b q_2 \right) \frac{\partial \theta}{\partial v} \\
 &= \frac{\partial}{\partial u} \left(\frac{\partial^3 \theta}{\partial u^2 \partial v} \right);
 \end{aligned}$$

and similarly

$$\begin{aligned}
 \frac{\partial}{\partial v} \left(\frac{\partial^3 \theta}{\partial u^2 \partial v^2} \right) &= \left(\frac{\partial r_1}{\partial v} + r_1^2 + r^2 \right) \frac{\partial^2 \theta}{\partial u \partial v} + \left(r_1 r_2 + \frac{\partial r^2}{\partial v} - 2a' r_3 \right) \frac{\partial \theta}{\partial u} + \\
 &\quad \left(r_1 r_3 + \frac{\partial r_3}{\partial v} - 2b' r_3 \right) \frac{\partial \theta}{\partial v} \\
 &= \left(\frac{\partial s_1}{\partial u} + s_1 q_1 + s_3 \right) \frac{\partial^2 \theta}{\partial u \partial v} + \left(s_1 q_2 + \frac{\partial s_2}{\partial u} - 2a s_2 \right) \frac{\partial \theta}{\partial u} + \\
 &\quad \left(s_1 q_3 + \frac{\partial s_3}{\partial u} - 2b s_3 \right) \frac{\partial \theta}{\partial v} \\
 &= \frac{\partial}{\partial u} \left(\frac{\partial^3 \theta}{\partial v^3} \right).
 \end{aligned}$$

The second of equations (3) gives on developing:

$$\begin{aligned}
 \frac{\partial}{\partial v} \left(\frac{\partial^3 \theta}{\partial u^2 \partial v} \right) &= \left(\frac{\partial q_1}{\partial v} + q_1 r_1 + q_2 \right) \frac{\partial^2 \theta}{\partial u \partial v} + \left(q_1 r_2 + \frac{\partial q_2}{\partial v} - 2a' q_3 \right) \frac{\partial \theta}{\partial u} + \\
 &\quad \left(q_1 r_3 + \frac{\partial q_3}{\partial v} - 2b q_3 \right) \frac{\partial \theta}{\partial v}, \\
 \frac{\partial}{\partial v} \left(\frac{\partial^3 \theta}{\partial u \partial v^2} \right) &= \left(\frac{\partial r_1}{\partial u} + q_1 r_1 + r_3 \right) \frac{\partial^2 \theta}{\partial u \partial v} + \left(r_1 q_2 + \frac{\partial r_2}{\partial u} - 2a r_2 \right) \frac{\partial \theta}{\partial u} + \\
 &\quad \left(r_1 q_3 + \frac{\partial r_3}{\partial u} - 2b r_2 \right) \frac{\partial \theta}{\partial v}.
 \end{aligned}$$

Thus in order that the second of equations (3) may be an identity, the following integrability conditions must be satisfied identically:

$$\frac{\partial q_1}{\partial v} + q_1 r_1 + q_2 = \frac{\partial r_1}{\partial u} + q_1 r_1 + r_3,$$

$$(4) \quad \begin{aligned} \frac{\partial q_2}{\partial v} + q_1 r_2 - 2a' q_3 &= \frac{\partial r_2}{\partial u} + r_1 q_2 - 2a r_2, \\ \frac{\partial q_3}{\partial v} + q_1 r_3 - 2b' q_3 &= \frac{\partial r_3}{\partial u} + r_1 q_3 - 2b r_2. \end{aligned}$$

If the values for q_i and r_i ($i=1, 2, 3$) in terms of the function ϕ be substituted and cognizance be taken of the relation (1), we find that the condition equations are indeed identities. Therefore all derivatives of higher order can be expressed uniquely in terms of $\frac{\partial^2 \theta}{\partial u \partial v}$, $\frac{\partial \theta}{\partial u}$,

$\frac{\partial \theta}{\partial v}$. Furthermore it can be shown that the Normal System has precisely three linearly independent solutions, apart, of course, from a constant which is obviously a solution.

On substituting the values of q_i and r_i ($i=1, 2, 3$) in terms of the function ϕ in equations (2) and making use of equations (A), we obtain the following equations:

$$(5) \quad \begin{aligned} \frac{\partial^3 \theta}{\partial u^2 \partial v} + \frac{\partial^2 \log \phi}{\partial u \partial v} \cdot \frac{\partial \theta}{\partial u} + 2 \frac{\partial \phi}{\partial v} \cdot \frac{\partial \theta}{\partial v} + \frac{\partial \log \phi}{\partial u} \cdot \frac{\partial^2 \theta}{\partial u \partial v} + \\ 2 \phi \frac{\partial^2 \theta}{\partial v^2} = 0, \\ \frac{\partial^3 \theta}{\partial u \partial v^2} + \frac{\partial^2 \log \phi}{\partial u \partial v} \cdot \frac{\partial \theta}{\partial v} + 2 \frac{\partial \phi}{\partial u} \cdot \frac{\partial \theta}{\partial u} + \frac{\partial \log \phi}{\partial v} \cdot \frac{\partial^2 \theta}{\partial u \partial v} + \\ 2 \phi \frac{\partial^2 \theta}{\partial u^2} = 0. \end{aligned}$$

Whence (on taking account of (1) and (A)):

$$\begin{aligned} \frac{\partial^3 \theta}{\partial u^2 \partial v} + \frac{\partial \log \phi}{\partial u} \cdot \frac{\partial^2 \theta}{\partial u \partial v} &= 0, \\ \frac{\partial^3 \theta}{\partial u \partial v^2} + \frac{\partial \log \phi}{\partial v} \cdot \frac{\partial^2 \theta}{\partial u \partial v} &= 0. \end{aligned}$$

Thus

$$\frac{\frac{\partial}{\partial u} \left(\frac{\partial^2 \theta}{\partial u \partial v} \right) du + \frac{\partial}{\partial v} \left(\frac{\partial^2 \theta}{\partial u \partial v} \right) dv}{\left(\frac{\partial^2 \theta}{\partial u \partial v} \right)} = - \left(\frac{\partial \log \phi}{\partial u} du + \frac{\partial \log \phi}{\partial v} dv \right);$$

and therefore by integrating this equation

$$(6) \quad \frac{\partial^2 \theta}{\partial u \partial v} = \frac{c_1}{2\phi},$$

where c_1 is a constant.

It is evident from the previous discussion that two of the three fundamental integrals of the Normal System will be solutions of the equation (6) when $c_1=0$, i.e., solutions of the equation

$$(7) \quad \frac{\partial^2 \theta}{\partial u \partial v} = 0.$$

The general integral of (6) is

$$(8) \quad \theta = \frac{c_1}{2} \iint \frac{du dv}{\phi} + U_1 + V_1,$$

where U_1 and V_1 are arbitrary functions of u and v respectively. To find the general solution of the Normal System it is necessary to choose the functions U_1 and V_1 so that the value of θ given by (8) will also satisfy the proposed system of equations.

We shall now determine the forms of the functions U_1 and V_1 . The equation

$$\frac{\partial_2 \log \phi}{\partial u \partial v} = 4 \phi^2$$

can readily be transformed into one of the Liouville type from which the general solution of the above equation is found to be (Sullivan C.T. Trans. Am. Math. Soc., Vol. XV, Series III, p. 176)

$$(9) \quad \phi = \frac{1}{2} \frac{\sqrt{U' V'}}{(U+V)},$$

where U and V are arbitrary functions of u and v respectively and the primes indicate differentiation of the functions with respect to their arguments.

Let us introduce the notation

$$U_2 = \int \frac{U}{\sqrt{U'}} du, \quad U_3 = \int \frac{du}{\sqrt{U'}},$$

$$V_2 = \int \frac{V}{\sqrt{V'}} dv, \quad V_3 = \int \frac{dv}{\sqrt{V'}}.$$

The direct differentiation of equations (8) and (9) gives (in terms of the notation just defined)

$$(10) \quad \frac{\partial \theta}{\partial u} = \frac{c_1}{\sqrt{U'}} (UV_3 + V_2) + U'_1,$$

$$\frac{\partial \theta}{\partial v} = \frac{c_1}{\sqrt{V'}} (VU_3 + U_2) + V'_1,$$

$$\frac{\partial^2 \theta}{\partial u^2} = \frac{c_1}{\sqrt{U'}} \left[V_3 \left(U' - \frac{1}{2} \frac{U}{U'} U'' \right) - \frac{1}{2} \frac{U''}{U'} V_2 \right] + U''_1,$$

$$\frac{\partial^2 \theta}{\partial v^2} = \frac{c_1}{\sqrt{V'}} \left[U_3 \left(V' - \frac{1}{2} \frac{V}{V'} V'' \right) - \frac{1}{2} \frac{V''}{V'} U_2 \right] + V''_1,$$

$$\frac{\partial \log \phi}{\partial u} = \frac{1}{2} \frac{U''}{U'} - \frac{U'}{U+V}, \quad \frac{\partial \log \phi}{\partial v} = \frac{1}{2} \frac{V''}{V'} - \frac{V'}{U+V}.$$

If we substitute these expressions in (A) there results an equation which can be reduced to

$$(11) \quad \frac{1}{\sqrt{U'}} \left[UU'_1 + \frac{1}{2} \frac{U}{U'} U'_1 U'' - U' \dot{U}'_1 + c_1 U_2 \sqrt{U'} \right] +$$

$$\left[V'_1 \sqrt{V'} + c_1 (VV_3 - V_2) \right] + V \left[c_1 U_3 + \right.$$

$$\left. \frac{U' U''_1 + \frac{1}{2} U'' U'_1}{U' \sqrt{U'}} \right] = 0,$$

i.e., to the form

$$\lambda(u) + \mu(v) + \rho(u)\sigma(v) = 0.$$

Whence

$$\begin{aligned}\lambda'(u) + \rho'(u)\sigma(v) &= 0, \\ \mu'(v) + \rho(u)\sigma'(v) &= 0.\end{aligned}$$

Thus either $\rho(u)$ or $\sigma(v)$ is a constant. But $\sigma(v) = V$ and $\sigma'(v) = V'$ which does not vanish; since if V' vanished ϕ would vanish. Hence $\sigma(v)$ is not a constant; therefore $\rho(u)$ must be a constant, *i.e.*,

$$\rho(u) \equiv c_1 U_3 + \frac{1}{U' \sqrt{U'}} (U' U''_1 + \frac{1}{2} U'' U'_1) = c_2 \text{ (a constant)}.$$

Now $\lambda(u)$ can be written in the form

$$\lambda(u) = \left[\frac{1}{\sqrt{U'}} \left\{ U \left(U''_1 + \frac{1}{2} \frac{U'' U'_1}{U'} + c_1 U_3 \sqrt{U'} \right) - c_1 U U_3 \sqrt{U'} - U' U'_1 + c_1 U_2 \sqrt{U'} \right\} \right],$$

which becomes (from the previous equation)

$$\lambda(u) = c_2 U - c_1 (U U_3 - U_2) - U'_1 \sqrt{U'}$$

Equation (11) therefore becomes

$$(11') \quad c_2 U - U'_1 \sqrt{U'} + c_1 (U_2 - U U_3) + V'_1 \sqrt{V'} + c_1 (V V_3 - V_2) + c_2 V = 0.$$

From the form of this equation, *viz.*,

$$\alpha(u) + \beta(v) = 0,$$

we conclude that

$$(12) \quad \alpha(u) \equiv c_2 U - U'_1 \sqrt{U'} + c_1 (U_2 - U U_3) = -c_3,$$

$$\beta(v) \equiv c_2 V + V'_1 \sqrt{V'} - c_1 (V_2 - V V_3) = +c_3,$$

where c_3 is a further constant.

Equation (12) can now be solved for U'_1 and V'_1 ; their values are

$$U'_1 = \frac{1}{\sqrt{U'}} \left[c_1 (U_2 - U U_3) + c_2 U + c_3 \right],$$

$$V'_1 = \frac{1}{\sqrt{V'}} \left[c_1 (V_2 - V V_3) - c_2 V - c_3 \right].$$

Hence

$$U_1 = \int \left[c_1 (U_2 - U U_3) + c_2 U + c_3 \right] \frac{du}{\sqrt{U'}},$$

$$V_1 = \int \left[c_1 (V_2 - V V_3) - c_2 V - c_3 \right] \frac{dv}{\sqrt{V'}}.$$

Substituting these values for U_1 and V_1 in (8) we find as the general integral of the Normal System

$$\begin{aligned}\theta &= \frac{c_1}{2} \iint \frac{du \, dv}{\phi} + \int \left[c_1 (U_2 - U U_3) + c_2 U + c_3 \right] \frac{du}{\sqrt{U'}} + \\ &\quad \int \left[c_1 (V_2 - V V_3) - c_2 V - c_3 \right] \frac{dv}{\sqrt{V'}}.\end{aligned}$$

Therefore, on evaluating the double integral, we obtain the following fundamental set of solutions for the Normal System:

$$\theta_1 = U_2 V_3 + U_3 V_2 + \int \left[(U_2 - U U_3) \frac{du}{\sqrt{U'}} + (V_2 - V V_3) \frac{dv}{\sqrt{V'}} \right]$$

$$(13) \quad \theta_2 = \int \left(U \frac{du}{\sqrt{U'}} - V \frac{dv}{\sqrt{V'}} \right) = U_2 - V_2,$$

$$\theta_3 = \int \left(\frac{du}{\sqrt{U'}} + \frac{dv}{\sqrt{V'}} \right) = U_3 + V_3.$$

The transformation of parameters which reduces these solutions to their simplest form disturbs the coefficients of (A); consequently we prefer to obtain the simplest parametric representation of the integral surfaces of the Normal System from other considerations.

Transformation of the Normal System which reduce it to the Monge Equation

$$s^2 - rt = \frac{1}{\lambda^2}.$$

Let (x, y, z) be three linearly independent solutions of the Normal System, and let (x, y) be chosen as independent variables. Then z will be a certain function of (x, y) satisfying the differential equations obtained from (A) and (6) by the transformation which replaces (u, v) by (x, y) and θ by z . In short, z will satisfy the differential equations which result from performing the transformations

$$(14) \quad x = x(u, v), \quad y = y(u, v), \quad \theta = z$$

on equations (A) and (6).

The relations between the two sets of derivatives are given by the equations:

$$(15) \quad \frac{\partial \theta}{\partial u} = px_1 + qy_1, \quad \frac{\partial \theta}{\partial v} = px_2 + qy_2,$$

$$\frac{\partial^2 \theta}{\partial u^2} = x_1^2 r + 2x_1 y_1 s + y_1^2 t + x_{11} p + y_{11} q,$$

$$\frac{\partial^2 \theta}{\partial u \partial v} = x_1 x_2 r + (x_1 y_2 + x_2 y_1) s + y_1 y_2 t + x_{12} p + y_{12} q,$$

$$\frac{\partial^2 \theta}{\partial v^2} = x_2^2 r + 2x_2 y_2 s + y_2^2 t + x_{22} p + y_{22} q,$$

where

$$p = \frac{\partial z}{\partial x}, \quad q = \frac{\partial z}{\partial y}, \quad r = \frac{\partial^2 z}{\partial x^2}, \quad s = \frac{\partial^2 z}{\partial x \partial y}, \quad t = \frac{\partial^2 z}{\partial y^2},$$

and the suffix *one* indicates derivation with respect to u , while the suffix *two* indicates derivation with respect to v . If $J \equiv$

$\left[\frac{\partial(x, y)}{\partial(u, v)} \right]$ be the Jacobian of (x, y) with respect to (u, v) , then J cannot vanish identically. Because if J vanished identically, the equations

$$\frac{\partial J}{\partial u} = 0, \quad \frac{\partial J}{\partial v} = 0,$$

combined with (7) would necessitate that x and y be solutions of the equations

$$(C) \quad \frac{\partial^2 \theta}{\partial u^2} + \alpha(u, v) \frac{\partial \theta}{\partial v} = 0,$$

$$\frac{\partial^2 \theta}{\partial v^2} + \beta(u, v) \frac{\partial \theta}{\partial u} = 0.$$

But (x, y) are linearly independent solutions of (A) and consequently cannot also be solutions of (C).

If the above values for $\frac{\partial \theta}{\partial u}$, $\frac{\partial \theta}{\partial v}$, etc., be substituted in (A) and (6), and cognizance be taken of the fact that (x, y, z) are solutions of (A) while (x, y) are also solutions of (7), we shall find

$$(16) \quad x^2_1 r + 2x_1 y_1 s + y^2_1 t = 0,$$

$$x_1 x_2 r + (x_1 y_2 + x_2 y_1) s + y_1 y_2 t = \frac{c_1}{2\phi},$$

$$x^2_2 r + 2x_2 y_2 s + y^2_2 t = 0.$$

The first and third of these are equivalent to

$$r = -2 \left(\frac{y_1 y_2}{x_1 y_2 + x_2 y_1} \right) s,$$

$$t = -2 \left(\frac{x_1 x_2}{x_1 y_2 + x_2 y_1} \right) s;$$

while from the second in conjunction with these we obtain

$$s = \left(\frac{c_1(x_1 y_2 + x_2 y_1)}{2\phi J^2} \right).$$

Therefore

$$(17) \quad s^2 - rt = \left(\frac{c_1}{2\phi J} \right)^2$$

It remains to be proved that the product

$$H = \phi J$$

is constant. In order to prove this it will be sufficient to show that

$$\frac{\partial H}{\partial u} = 0, \quad \frac{\partial H}{\partial v} = 0.$$

Now

$$\frac{\partial H}{\partial u} = \phi (x_{11} y_2 - x_2 y_{11}) + J \frac{\partial \phi}{\partial u},$$

$$\frac{\partial H}{\partial v} = \phi (x_1 y_{22} - x_{22} y_1) + J \frac{\partial \phi}{\partial v}.$$

Since x and y are solutions of (A), these equations become

$$\frac{\partial H}{\partial u} = \phi y_2 \left(x_{11} + \frac{\left(\frac{\partial \phi}{\partial u} \right)}{\phi} x_1 \right) - \phi x_2 \left(y_{11} + \frac{\left(\frac{\partial \phi}{\partial u} \right)}{\phi} y_1 \right)$$

$$= 2(\phi^2 - \phi^2) x_2 y_2 = 0,$$

$$\frac{\partial H}{\partial v} = \phi x_1 \left(y_{22} + \frac{\left(\frac{\partial \phi}{\partial v} \right)}{\phi} y_2 \right) - \phi y_1 \left(x_{22} + \frac{\left(\frac{\partial \phi}{\partial v} \right)}{\phi} x_2 \right)$$

$$= 2(\phi^2 - \phi^2) x_1 y_1 = 0.$$

Therefore H is a constant, and equation (17) becomes

$$(B) \quad s^2 - rt = \frac{1}{\lambda^2} \text{ (where } \lambda = \text{const.)}$$

From this we conclude that the integral surfaces of the Normal System are necessarily integral surfaces of the Monge equation (B).

We now proceed along classical lines to the integration of the Monge equation (B). There will be two distinct sets of subsidiary equations from which to construct the intermediary integrals of the general Monge equation

$$Rr + Ss + Tt + U(rt - S^2) = V,$$

(where R, S, T, U, V are functions of x, y, z, p, q) provided intermediary integrals exist and the equation

$$\theta^2(RT + UV) + \theta US + U^2 = 0$$

has distinct roots. If now the values of R, S, T , etc., in equation (B) be substituted in this equation, the roots are:

$$\theta = \pm \frac{1}{\lambda}.$$

Hence the two sets of subsidiary equations are:

$$(a) \quad \begin{aligned} \lambda dx - dq &= 0, \\ \lambda dx + dp &= 0, \\ dz - p dx - q dy &= 0, \end{aligned}$$

and

$$(b) \quad \begin{aligned} \lambda dx + dq &= 0, \\ \lambda dy - dp &= 0, \\ dz - p dx - q dy &= 0. \end{aligned}$$

From these we obtain two intermediary integrals of (B), viz.,

$$\lambda x - q = 2\psi(\beta), \quad \lambda y + p = 2\beta,$$

and

$$\lambda x + q = 2\phi(\alpha), \quad \lambda y - p = 2\alpha.$$

Thus

$$\begin{aligned} \lambda x &= \phi(\alpha) + \psi(\beta), \quad \lambda y = \alpha + \beta, \\ p &= -\alpha + \beta, \quad q = \phi(\alpha) - \psi(\beta). \end{aligned}$$

Substituting these values in the equation

$$\lambda dz = \lambda p dx + \lambda q dy,$$

we find

$$\lambda dz = (-\alpha + \beta)(d\phi + d\psi) + (\phi - \psi)(d\alpha + d\beta),$$

and therefore (on integration)

$$\lambda z = (\phi - \psi)(\alpha + \beta) - 2 \int (\alpha d\phi - \beta d\psi).$$

Now put (for uniformity of notation)

$$\phi(\alpha) = G'(\alpha) = U'(u), \quad \psi(\beta) = H'(\beta) = -V'(v);$$

then the above equations become (on evaluating the integral)

$$(18) \quad \begin{aligned} \lambda x &= U' - V', \\ \lambda y &= u + v, \\ \lambda z &= 2(U + V) - (u - v)(U' - V'). \end{aligned}$$

A simple transformation of coordinates and parameters establishes at once the identity of equations (13) and (18). In short, if in equations (13) we make the transformations

$$(19) \quad u = U_3, v = V_3, U_2 = \overline{U}', V_2 = \overline{V}'; \\ x = 2\lambda z, y = \lambda x, z = \lambda y,$$

and subsequently drop the bars, the resulting equations are identical with (18).

Remarks.

1°. It is to be noted that since U', V' of equations (13) are distinct from zero, the functions U, V in the equations resulting from the transformation of parameters in (19) are of the third degree at least.

2°. If in (18) or (13) after performing the transformation of parameters (19) we put

$$U = Q_2(u), V = Q'_2(v),$$

where Q_2 and Q'_2 are quadratic functions, the integral surface is a ruled quadric.

3°. If in the same equations we put

$$U = Q_2(u), V = Q_3(v),$$

where Q_2 is a quadratic function and Q_3 is a cubic function, the following invariants of the Normal System vanish:

$$\theta^{(2)} \equiv 64 \left(\frac{\partial b}{\partial v} \right)^2 - 128b \left(\frac{\partial^2 b}{\partial v^2} + 2bg + 2b \frac{\partial a'}{\partial u} \right),$$

$$h \equiv b^2 \left(f + \frac{\partial b}{\partial v} \right) - \frac{1}{4}b \frac{\partial^2 b}{\partial u^2} + \frac{5}{16} \left(\frac{\partial u}{\partial b} \right)^2,$$

$$\Omega^{(1)} = \Omega^{(2)} \equiv \frac{\partial^2 \log a'}{\partial u \partial v} - 4a'b.$$

But when these invariants vanish the integral surface is a Cayley cubic scroll.*

Geometrical considerations.

The parametric curves are asymptotic curves on the surface (18), since the characteristics of a Monge equation are asymptotic curves on an integral surface of the equation. Let (yz') , (zx') , (xy') , etc., be the Plückerian coordinates of a line; then we shall find from equations (18) that the asymptotic curves $u=\text{const.}$, $v=\text{const.}$ on the integral surfaces of the Monge equation (B) belong to the linear complexes

$$(20) \quad \lambda(xy') + 2u(x-x') + (z-z') = 2U'(y-y'),$$

and

$$\lambda(xy') + 2v(x-x') - (z-z') = -2V'(y-y')$$

respectively.

The axis of a complex being that diameter which is perpendicular to its polar planes, it follows that the axes of these complexes are given by the equations

$$(21) \quad \lambda x = -2U', \lambda y = -2u,$$

and

$$\lambda x = 2V', \lambda y = -2v$$

respectively.

*Wilczynski, Trans. Am. Math. Soc., Vol. viii., p. 250; Vol. ix., p. 89.
Sullivan, C. T., Trans. Am. Math. Soc., Vol. xv., pp. 175, 191.

The principal parameters of the complexes (20) are constant, and the axes (21) of these complexes are parallel to the z -axis.

Inversely, if a surface be such that the tangents to its asymptotic curves belong to linear complexes of constant principal parameters and having their axes parallel to the z -axis (any line may be taken as the z -axis), then it must be an integral surface of the Monge equation (B).

Let us consider the asymptotic curves $u = \text{const.}$, and let the constant value of the principal parameters of the complexes be $\frac{1}{\lambda}$.

Since the axes of the complexes are parallel to the z -axis, the equation of the complexes must be of the form

$$(22) \quad (xy') = a(x - x') + \beta(y - y') + \gamma(z - z'),$$

where a, β, γ are functions of u . From the condition imposed on the principal parameters it follows that $\gamma(u) = \frac{1}{\lambda}$. Hence the equation of the complexes becomes

$$(xy') = a(x - x') + \beta(y - y') + \frac{1}{\lambda}(z - z').$$

Now the polar plane of a point $P(x, y, z)$ on the surface proposed in the complex (22) must be an osculating plane to the asymptotic curve $u = \text{const.}$ through this point. Hence the polar plane of $P(x, y, z)$ in (22) must be the tangent plane to the surface at P . On identifying these two planes, we find

$$(23) \quad \begin{aligned} -p &= -\frac{\partial z}{\partial x} = -\lambda(y + a), \\ -q &= -\frac{\partial z}{\partial y} = +\lambda(x - \beta). \end{aligned}$$

If we consider a as an arbitrary function of β , we have

$$\left(\frac{p}{\lambda} - y\right) = G\left(\frac{q}{\lambda} + a\right).$$

Hence

$$s^2 - rt = \lambda^2,$$

which is the Monge equation considered.

Let us now consider a surface S whose equation is

$$z = f(x, y).$$

If through the point $(x, y, 0)$ a line be drawn parallel to the normal to S at $P(x, y, z)$, the totality of these lines constitute a congruence G which we shall call the associated congruence of the surface S . And inversely, if the normal to a surface S at the point (x, y, z) be parallel to the line of a congruence G through the point $(x, y, 0)$, we shall call S the associated surface of the congruence G .

The congruence G associated with the surface S is generated by the line

$$(24) \quad \begin{aligned} \xi + p\zeta &= x, \\ \eta + q\zeta &= y, \end{aligned}$$

where (ξ, η, ζ) are current coordinates and $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$.

The projection on the plane $z=0$ of the net of curves on S which corresponds to the developables of G is found by eliminating (ξ, η, ζ) between (25) and the equations

$$(25') \quad \begin{aligned} \xi + (p + rdx + sdy)\zeta &= x + dx, \\ \eta + (q + sdx + tdy)\zeta &= y + dy. \end{aligned}$$

Thus this net of curves is given by the equation

$$(26) \quad \left(\frac{r-t}{s}\right) = \left(\frac{dx^2 - dy^2}{dx dy}\right).$$

The planes tangent to the two developables of G that pass through the line (25) are also tangent to the focal surface of G . The directions of the traces of these planes on the (xy) plane are given by equation (26); their equations are then

$$[\xi - (x - p\zeta)] - \lambda [\eta - (y - q\zeta)] = 0,$$

where λ is a solution of the equation

$$\lambda^2 - \left(\frac{r-t}{s}\right)\lambda - 1 = 0.$$

Since the roots of the latter equation are real and distinct, the focal surface of G has two distinct sheets.

If the ray (25) be tangent to the focal surface at P and Q and M be the middle point of PQ , the locus of M is called the *middle surface* of the congruence (Eisenhart, Differential Geometry, p. 399).

Let us now consider the congruence G whose middle surface is the simplest type, viz., a plane. We shall find that the integral surfaces of the Normal System (A) or what is the same thing, as we have seen, the integral surfaces of the Monge equation (B) are associated surfaces of the congruence contemplated.

In short we find from equations (25) and (25') that

$$\begin{aligned} \zeta(rdx + sdy) &= dx, \\ \zeta(sdx + tdy) &= dy, \end{aligned}$$

and therefore

$$(27) \quad \zeta^2 + \left(\frac{r+t}{s^2 - rt}\right)\zeta - 1 = 0.$$

The altitude of the point M above the (xy) plane is $-\frac{1}{2} \left(\frac{r+t}{s^2 - rt}\right)$.

If the middle surface of G be the plane ($z=0$), the associated surface S must be an integral of the Laplace equation

$$(28) \quad \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} \equiv r + t = 0.$$

Now (28) is precisely the condition that the net of curves obtained by projecting the asymptotic curves of S on the (xy) plane may be orthogonal; because the directions of the curves of the net through the point (x, y) are given by the equation

$$rdx^2 + 2sdx dy + tdy^2 = 0;$$

and these are orthogonal if and only if $z(x, y)$ be an integral of equation (28).

If, however, the middle surface of G be the plane $\left(z = \frac{-1}{2\lambda_1}\right)$,

the associated surface S must be an integral of the equation

$$\frac{r+t}{rt-s^2} = \frac{-1}{2\lambda_1}$$

i.e., the equation

$$(r + \lambda_1)(t + \lambda_1) = s^2 + \lambda_1^2.$$

Now put

$$r + \lambda_1 = r_1, \quad t + \lambda_1 = t_1,$$

i.e.,

$$z_1 = z + \frac{\lambda_1}{2}(x^2 + y^2),$$

and therefore

$$s_1 = s.$$

Hence the associated surface S must be an integral of the Monge equation $s^2 - rt = \frac{1}{\lambda^2}$ (on changing the notation slightly).

In addition to effecting the direct integration of the Normal System, we have now established the following results:

The integral surfaces of the Normal System are also integral surfaces of the Monge equation (B).

These surfaces constitute an important subclass of the surfaces whose asymptotic curves belong to linear complexes; and are characterized by the metrical property that the linear complexes which contain their asymptotic curves have their axes parallel to a fixed line (the z -axis), and also have their principal parameters constant.

A metrical characterization apparently entirely unrelated to the preceding can be given to these surfaces, namely; they may be regarded as the associated surfaces of a certain line congruence whose medial surface is a plane parallel to the (xy) plane.

McGill University,
Montreal.



Transactions of The Royal Society of Canada

SECTION III

SERIES III

MARCH 1917

VOL. X

Contact Resistance between Conductors in Relative Motion.

By VIOLET HENRY, M.Sc.

Presented by PROF. H. T. BARNES, F.R.S.C.

(Read May Meeting, 1916).

Upon first consideration it might be expected that the resistance of a moving contact would be less than for a stationary one. Such a conclusion is, however, seen to be erroneous, when one considers the conditions at the surfaces of any two conductors making contact. It is now generally accepted that between the surfaces of two electrical conductors there exists a film through which it is difficult for an electrical current to flow. The nature of this surface film depends upon the composition of the conductor, the condition of the surface, and upon the length of time which has elapsed since the surfaces were cleaned. Motion between the conductors produces a condition which tends to oppose the establishment of a uniform electric flow across the contact, in as much as a continuous breaking down of new surface film results.

DETAILS OF APPARATUS.

The method of study used in the present investigation was somewhat similar to that used by H. E. Reilley¹, in which an account is given of the measurement of contact resistances for various pressures applied to stationary contacts.

One of the conductors consisted of a flat disc, an alloy of silver and gold, which could be rotated. The other conductor consisted of a contact of the same alloy, connected with the moving coil of a Weston relay. The disc was 1.8 cms. in diameter, the relay needle 4.4 cms. long. The end of the needle which pressed against the disc was shaped like an arrow head. See Fig. 1.

¹ See Fig. 1. Trans. of Royal Society, vol. 8, p. 125, 1914.

B_1 and B_2 are storage batteries each having an E.M.F. of about 2 volts.

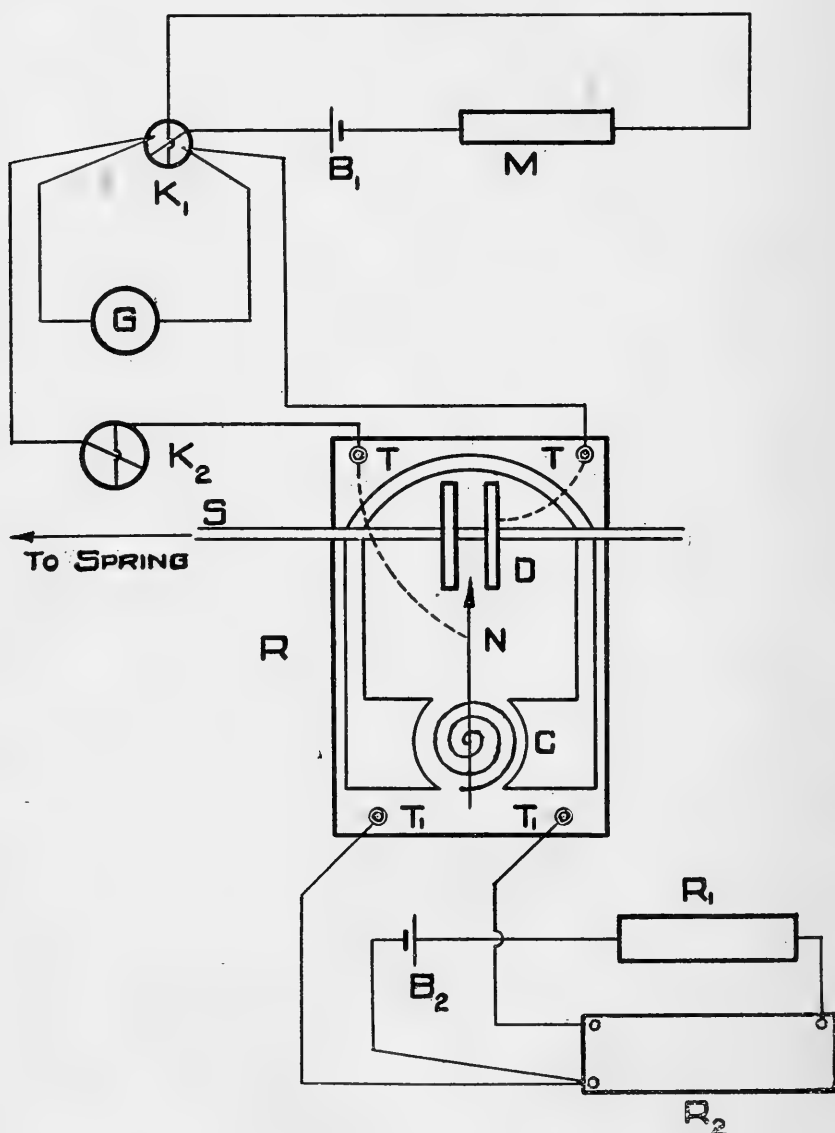


Figure 1.

M is a megohm consisting of resistance coils of 100,000, 200,000, 300,000, 400,000 ohms.

G is a Broca Galvanometer No. 6964.

A scale and a reflected spot of light were used to indicate the current passing through the galvanometer.

K_1 is a reversing key.

K_2 is a key to break the circuit.

R is the relay consisting of D the revolving disc, N the needle (used in making contact), C the moving coil of the relay, S the shaft through the disc to the spring, T the terminals of the main circuit, T_1 the terminals of the relay coil.

R_1 is a standard resistance containing coils from 1 to 100 ohms.

R_2 is a standard resistance box in the form of a Wheatstone's Bridge.

APPLICATION OF PRESSURE.

To apply various pressures between the needle and the rotating disc electric currents of various strengths were passed through the moving coil of the relay. The pressure with which the needle was held against the disc was proportional to the current passing through the coil of the relay, since the deflection of the coil and hence the deflection of the needle depended on the current flowing through the coil. This deflecting current was obtained from a circuit composed of the storage cell B_2 (Fig. 1), a standard resistance box R_1 , with coils ranging from 1-100 ohms in series with a resistance box R_2 in the form of a Wheatstone's Bridge used as a potentiometer. Hence being able to change the resistance in the potentiometer and in the 100 ohm resistance box it was possible to keep the total current in the circuit constant and yet vary the current through the relay coil so as to obtain various pressures.

The method of measuring the contact resistance was that of "substitution." A standard resistance box was substituted for the contact wires, and by putting into the circuit various coils of the resistance box it was possible to calibrate the scale for all deflections, corresponding to resistances from infinity to zero. The megohm prevented any sudden change of the E.M.F. of the battery, so that there was little or no change even after the battery had been in use for several days. The resistance of the galvanometer coils was about 84 ohms. The deflection when the contact wires were in the circuit was noted and from the curve the resistance was obtained.

ROTATION OF CONTACT.

The disc was rotated by means of a shaft attached to a very heavy steel motor clock. It was possible to obtain uniform speed of rotation by keeping the spring tightly wound. The spring when once wound tight could apply a driving force for a period of twenty-four hours.

Hence it is easy to understand that the variation of speed during the first twenty minutes after a winding was practically negligible. Before each observation during a set of readings the spring was tightly wound, thus assuring a uniform speed. To obtain various speeds weights were suspended from the driving shaft of one of the lighter wheels. For instance, with no weight on at all, the fastest speed was .124 revolutions per second.

With	20 grms.	.115	revolutions per second		
	30 "	.112	"	"	"
	40 "	.108	"	"	"
	50 "	.1057	"	"	"
	60 "	.102	"	"	"
	70 "	.100	"	"	"
	80 "	.097	"	"	"
	90 "	.094	"	"	"
	100 "	.0926	"	"	"
	110 "	.087	"	"	"

The observations were repeated many times to be certain that in each case the number of revolutions per sec. did not vary.

RESULTS.

The needle and the disc were cleaned with fine emery paper and then rubbed with chamois. The spring was wound tight, and just enough pressure exerted to cause good contact when stationary. The disc was then allowed to revolve at the rate of .124 revolutions per sec., the resistance at once increased from 0 to ∞ . The speed was then decreased and the resistance fell slightly. By making the speed less and less the resistance showed corresponding decreases. The slowest rate obtainable with the apparatus was .087 revolutions per sec. The resistance was then 500 ohms. In this way it was noticed that the resistance was proportional to the number of revolutions per sec., the pressure being kept constant. Curve I Fig. 2 shows the relation between the speed of rotation and the resistance for the smallest pressure as already indicated.

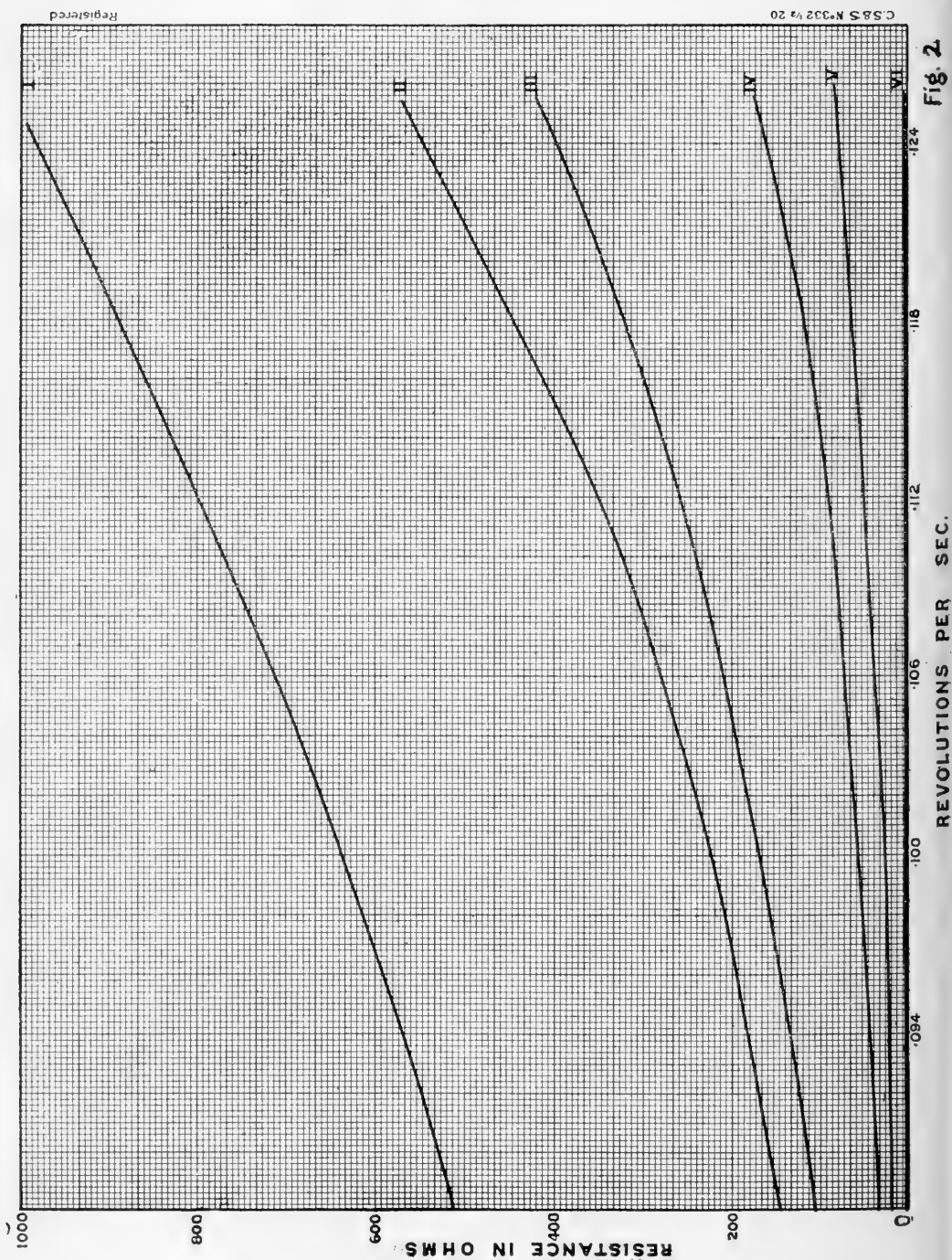
Revolutions per sec.	Resistance.
.124	990 ohms
.115	837 "
.112	780 "
.108	737 "
.1057	720 "
.102	670 "
.100	
.097	597 "
.094	573 "
.0926	550 "
.087	510 "

See Curve I Fig. 2.

The next observations taken were to see if it were possible to exert such a pressure as to always have good contact even if the disc was revolving at its greatest speed. The spring was wound and the disc adjusted as before. It was found that when the current sent through the relay was 73.3 times as great as in the previous case, it caused such a pressure that there were only very slight deviations from good contact for the maximum speed of the motor clock.

Revolutions per sec.	Resistance.
.124	2.3 ohms.
.115	2.0 "
.112	2.0 "
.108	1.8 "
.1057	1.8 "
.102	1.8 "
.100	1.8 "
.097	1.8 "
.094	1.6 "
.0926	1.6 "
.087	1.0 "

See Curve VI Fig. 2.



The following tables give the contact resistances for pressures produced by relay currents (a) 2.44, (b) 3.43, (c) 5.33, (d) 10.1 times as great as that current necessary to produce good contact when the disc was stationary.

With pressure (a) Revolutions per sec.	Resistance.
.124	560 ohms.
.115	390 "
.112	339 "
.108	300 "
.1057	272 "
.102	256 "
.100	219 "
.097	197 "
.094	186 "
.0926	177 "

See Curve II Fig. 2.

With pressure (b) Revolutions per sec.	Resistance.
.124	305 ohms.
.115	285 "
.112	246 "
.108	220 "
.1057	198 "
.102	178 "
.100	174 "
.097	143 "
.094	137 "
.0926	128 "
.087	106.7 "

See Curve III Fig. 2.

With pressure (c)	
Revolutions per sec.	Resistance.
.124	176 ohms.
.115	96.2 "
.112	80 "
.108	75 "
.1057	64 "
.102	53.5 "
.100	48 "
.097	43 "
.094	40 "
.0926	39 "
.087	33 "

See Curve IV Fig. 2.

With pressure (d)	
Revolutions per sec.	Resistance.
.124	76 ohms.
.115	63.5 "
.112	53 "
.108	46.7 "
.1057	39.5 "
.102	33 "
.100	28.7 "
.097	24.2 "
.094	20 "
.0926	16.5 "
.087	14.2 "

See Curve V Fig. 2.

It was observed that with a small pressure and the faster speeds the spot of light on the scale seldom came to rest but vibrated back and forth. The preceding tabulated results are the mean of a large number of such vibrations. For larger pressures the spot was steadier. The curves were repeated many times, and when the needle and disc were under the same conditions the curves were the same.

These curves giving the relation between resistance and speeds show conclusively that the contact resistance increases in proportion to the speed. It is thus seen that a continuous flow of electrons at the contact point is maintained with greater difficulty than when the contacts are stationary. An examination of the curves shows that the contact resistance is inversely proportional to the pressure applied; this might also be expected from the standpoint that when the contacts are moving relatively to each other the electrons have smaller opportunity of breaking down the intervening film, and hence a greater pressure is necessary to overcome the resistance of the film.

Contact Resistance in Oil.

By H. E. REILLEY, M.Sc., and VIOLET HENRY, M.Sc.

Presented by PROF. H. T. BARNES, F.R.S.C.

(Read May Meeting, 1916).

Contact resistance may be defined as the electrical resistance of the junction of two conductors of similar or dissimilar metals or alloys. There have appeared several papers dealing particularly with the effect of pressure on the contact resistance when applied to the contact surface. If two electric conductors are arranged in a circuit in such a way that pressure may be applied at the junction of the two conductors, the electrical resistance at the contact point will unquestionably depend upon the pressure applied to the conductors.

In none of these papers are given data for the values of minimum pressure necessary to produce a low resistance contact, where a current is conducted from one piece of metal or alloy to a similar or dissimilar metal or alloy as the case may be.

In a paper by Streintz and Wesley¹ are given the results of researches on the resistance between two plane circular plates of brass. The diameters of these plates were 2.6, 1.97, 1.77 and 1.0 cms. respectively. It was found that the conductivity from one plate to the other across the junction was proportional to the applied pressure, and also to the diameter of the plate used. There are included in this paper several pressure resistance curves. The pressures applied ranged approximately, from 50 to 8,500 grms. The resistances were found to have values between 29 and 521 microhms. These investigators also studied the effects produced by media other than air upon the contacts. Their results show that when brass plates were immersed in oil the contact resistance was considerably less than in air; or in other words the same pressure would produce better contact in oil than in air. This fact is also borne out by results obtained by William Browning.² Two brass circular plates 1.54 sq. cms. in area were used and it was found that the conductivity of the contact varied almost directly as the mechanical pressure between the contacts up to a certain value of the pressure. If oil was present, the conductivity was greatly increased.

¹ Physikalisch Zeitschrift 489, 1913.

² Journal of Instit. of Elec. Eng. Vol. 37, p. 372, 1906.

In a more recent paper by Mr. H. E. Reilley¹ is given an account of experiments for the determination of the relation between contact resistance of similar metals and alloys and the pressure applied to the electrical junction.

The author also considered the effect on the pressure-resistance ratio of conductors due to careful cleaning of the surfaces forming electrical contact. It was clearly shown that the resistance at the junction of two substances in contact depends upon the pressure to which the contacts are subjected.

The paper contains curves for nickel, constantan, german silver, platinum-silver, fery-wire, gold, copper, manganin, gold-plated wire and platinum. In all these cases the electrical conductivity increases in proportion to the pressure.

By means of a mechanical device he measured the absolute pressure, that is the pressure necessary to reduce the electrical resistance from infinity to zero. Furthermore, he was able to measure the effect of immersing the contacts in kerosene oil. In every case the pressure on the contacts when in oil was less than the pressure in air for any given contact resistance value. The following table gives the values for the various substances investigated.

Substance.	Pressure in air.	Pressure in oil (Approx. value).	Residual Resistance.
Fery-Wire.....	200 mgms	160-170 mgms.	1.5 ohms
German-Silver.....	220 "	180 "	.2 "
Platinum-Silver.....	100 "	40 "	.4 "
Constantan.....	160 "	100 "	.5 "
Manganin.....	40 "	30-40 "	.4 "
Copper.....	60 "	50 "	0. "
Silver.....	44 "	34 "	.3 "
Nickel.....	140 "	50 "	1.0 "
Platinum.....	50 "	25 "	.6 "
Gold.....	100 "	25 "	.5 "
Gold-Plated Manganin....	40 "	20 "	.2 "
Aluminum.....	180 grams	100 grams.	.2 "

In the latter part of the paper are given the results of investigations upon the effect of carefully cleaning the contacts, and as was expected, cleaning brought about a large decrease in the absolute pressure, the change being from 200 mgs. to 50 mgs. approximately.

¹ Trans. of Royal Society. Vol. 8, p. 125, 1914.

PRESENT EXPERIMENTS.

The series of experiments described herein were undertaken for the purpose of determining accurately the minimum pressure required to produce good contact between metal wires. In order to obtain this, careful observations were made of the change in contact resistance between what we may term open circuit, or infinite resistance, to that of good contact. It was necessary, therefore, to arrange the apparatus so that the contact resistance could be observed simultaneously with the applied pressure. In this way a great many observations were taken showing how the contact resistance decreased with increasing pressure for metal wires both in air and in various oils. It was hoped that some light might be thrown on the nature of contact resistance and also to show the advantage of using oil for increasing the efficiency of electrical contact.

These experiments are a continuation of the work done by Mr. Reilley. The same apparatus was used and the same means of changing the pressure. See Figure I.

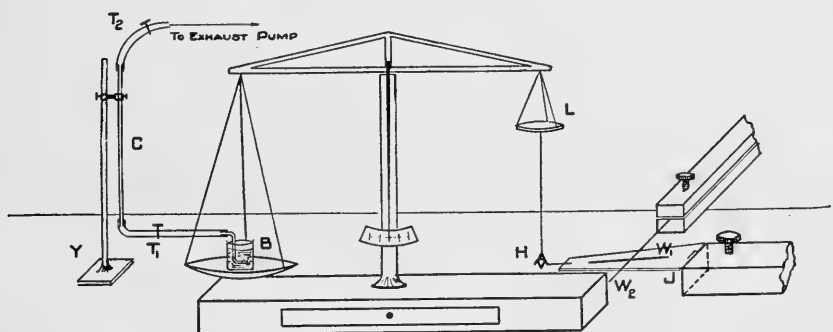


Figure 1.

B, is a glass beaker partly filled with water.

T_1 is a tap.

T_2 is a three way tap.

C, is a tube containing 1 c.c. By changing the level of water in C, the weight of water taken out or put into B is known.

L, lead weight used to balance pan.

W_1 , wire soldered to movable jaw, J.

W_2 , wire firmly clamped.

By moving J up, W_1 is brought into contact with W_2 . This is done by changing the weight on left hand balance pan. Y, is a clamp to support C.

It was found in using this method that the absolute pressure changed if the supporting thread did not hang plumb.

ADJUSTMENT OF APPARATUS.

To prevent such a change the contact was placed in a wooden frame which fitted tightly into a circular glass vessel. One corner of the frame had a piece of steel in it always placed at the edge of a strip of paper pasted to the outside of the glass vessel which was moved round until the thread, when hanging vertically was directly over the hook of the movable jaw. Then the position of the edge of the paper and the base of the vessel was marked on a large sheet of paper fastened to the floor of the balance. Thus, the contact wires, glass vessel and balance always occupied the same relative positions. The jaw could be moved sideways. To make sure that the thread always hung vertically a small lead pointer was attached to the lower end of the brass loop. Beneath this pointer was placed in the wooden base a small round brass pin. After the contact wires were connected, they were placed in the marked position in the vessel; the vessel and the movable jaw were adjusted until the pointer was directly over the small brass pin. This being in the same position for all observations, the absolute pressures could be compared.

TABLE I.

Wires.	1 Air.	2 Kero- sene.	3 Gaso- line.	4 Machine oil.	5 Dried Machine oil.	6 Trans- Former oil.	7 Dried Trans- former oil.
	mg.	mg.	mg.	mg.	mg.	mg.	mg.
Platinum.....	50	25	82	62	48	110	95
Silver.....	44	34	86	56	49	70	62
Copper.....	60	50	65	39	..	65	52
Nickel.....	140	50	44	84	62	74	71
Manganin.....	48	30-40	60	64	59	58	..
Constantan	160	100	145	62	50	97	97
Ferry.....	200	160-170	137	138	95	166	161

CONCLUSION.

By comparing columns 1 and 2, Table 1, it is seen that the absolute pressure in kerosene is less than in air in every case. These results are taken from the paper by Mr. Reilley. It is also to be noted that these pressures do not include what might be termed the

residual pressure necessary to reduce the contact resistance to zero. In the table of pressures already given is included a column under the heading "residual resistance." This residual resistance is the contact resistance, which could be lessened by the application of very large pressures as compared with the contact pressure necessary to reduce the resistance to what is called "residual resistance."

The first part of this investigation consisted in the determination of contact resistances for platinum, silver, copper, nickel, manganin, constantan, and fery-wire in baths of gasoline, using the wires in the order in which they are mentioned. In the case of platinum if the residual resistance was not included, then the pressure was 45 mgs.; if the residual resistance was included, the pressure was 82 mgs. This result is consistent with the value obtained for platinum in kerosene. The contact pressure for silver shows similar values for kerosene and gasoline. In the case of copper, as indicated in the table already referred to, there was no residual resistance. With the contacts in air the required pressure was 60 mgs. in air, 50 in kerosene and in gasoline 65. The values of the contact pressures for nickel in air, kerosene and gasoline show the resistance effects of oil baths, in air the pressure being 140 mgs., in kerosene 50, and in gasoline 43.8. For manganin the values of contact pressure in kerosene and gasoline (if the necessary residual resistance correction be made) are less than in air; the same applies for constantan and fery-wires, the values for the former in air, kerosene and gasoline being, 160, 100, 145 mgs. respectively; for the latter 200, 165, 137 mgs. respectively.

The contact pressures necessary to produce zero resistance for these various metals and alloys in machine oil and dried machine oil were next determined. The purpose of drying the oil was to observe the effect of moisture on the resistance of the contacts. The oil was dried by filtering several times through large quantities of sodium. This drying process was done frequently to make sure that no moisture remained in the oil bath. In the bottom of the oil bath were placed large pieces of sodium which were allowed to remain there, even while the observations were being made. The results obtained show without a doubt that the careful drying of the oil lessened the contact pressure. In every case for both the metals and alloys the contact pressure in the dried machine oil is considerably less than in the undried oil.

For platinum in undried machine oil a pressure of 63 mgs. produced good contact. This was lessened by 20% in dried machine oil; for silver 56 mg. with a decrease of 10% in the dried oil; for nickel 84.5 mgs. with a falling off of 25%; for manganin 64 mgs. constantan 62, fery-wire 128 with somewhat smaller diminutions of

resistance in the case of the first two and a decrease of 35% in the last one. Undried and dried transformer oil were substituted for machine oil and observations made for the metals and alloys as before. The same care was exercised in the drying of the transformer oil as in the machine oil. The results agree with those obtained when using baths of machine oil. The contact pressure in the dried transformer oil was in every case less than for the undried oil excepting for constantan, which appeared to have the same in the undried and dried oil.

For platinum the value of the pressure in the undried transformer oil was 110, and in the dried 95 mgs. Considerable difficulty was experienced in obtaining satisfactory observations for the platinum contact in transformer oil both undried and dried. The contact pressure for silver in the former was 70 mgs; in the latter 62 mgs.; for copper 65 and 51 mgs.; for nickel 74 and 71 mgs.; constantan 97 and 97 mgs.; and for fery-wire 166 and 161 mgs.

In every case the amount of decrease of the contact pressure by drying the machine oil was much greater than in the change produced by drying the transformer oil.

Another point worthy of note is that throughout all the observations the greatest contact pressures were those for constantan and fery-wire. The chemical compositions of these two substances are similar and hence the reason for the corresponding high pressure values.

In all these investigations well cleaned wires were used. Each wire was rubbed vigorously with the finest of emery paper and afterwards with a piece of chamois to remove the small particles of the loosened material, which cling to the surface of the wire.

Columns 3, 4, and 6, Table I, give the pressure values for gasoline, machine oil and transformer oil. It is shown that the absolute pressure depends upon the kind of oil used.

Columns 5 and 7 give the pressures obtained with the various metals and alloys in dried machine oil and dried transformer oil. These values indicate that the pressure is less than in the same undried media. Hence it would seem as if the contact resistance is due to the surface conditions of the contact wires. Evidently the moisture produces an increase of resistance.

This substantiates the conclusion arrived at in the article previously referred to, that the contact resistance is largely due to a cushion effect produced by the formation of a film on the surface of the substance, which film in some cases ultimately becomes the oxide. It must also be noted that the contact resistance increased with time which is undoubtedly the result of a slowly forming surface film, the rate of formation being decreased by the exclusion of moisture from the contact wires.

*On the Initial Charged Condition of the Active Deposits of Radium,
Thorium and Actinium.*

BY G. H. HENDERSON, M.A.,

Instructor in Physics, Dalhousie University, Halifax, N.S.

Presented by H. L. BRONSON, Ph.D., F.R.S.C.

(Read May Meeting, 1916).

In spite of the fact that the transformations of the emanations of radium, thorium and actinium are accompanied by the expulsion of positively charged α particles, it is a well known fact that a large percentage of the active deposits of all three can be collected on a negative electrode. This phenomenon has been the subject of a considerable number of investigations. In the present investigation the writer is continuing work previously done on this subject, and it is hoped that many doubtful points and apparent discrepancies, which have arisen in previous investigations, have been cleared up and that a rational explanation has been found for the behaviour of the active deposits in an electric field.

RESUMÉ OF PREVIOUS WORK.

In early experiments made by Rutherford,¹ the amount of the active deposit of thorium collected on a wire rod inside a cylindrical can was about 200 times as great when the rod was cathode as when it was anode. This showed that a large proportion of the active deposit particles (rest-atoms) were positively charged. However, if account be taken of the activity on the case, the percentage of the total activity on the cathode was less than 99.5%. In a similar way Rutherford² found that about 95% of the active deposit of radium was collected on the cathode.

Working with radium emanation in air at pressures less than atmospheric, Russ³ found that the amount of active deposit collected on a wire rod as cathode, decreased as the pressure was decreased, while that collected on the rod as anode increased with the decrease of pressure. This was probably due to the increased length of the

¹ Rutherford, Phil. Mag., Feb., 1900.

² Rutherford, Phil. Mag., Jan., 1903.

³ Russ, Phil. Mag., May, 1908.

path of the recoiling rest-atoms, at the lower pressures. The longer path would allow more of the rest-atoms to reach the anode, since their motion during recoil is practically unaffected by the field.

In similar experiments with actinium Russ⁴ found that the ratio of the active deposit on a central rod when cathode to that on the rod when anode at first increased, reached a maximum and then decreased, as the pressure was continually lowered. The final decrease with low pressures was probably due to the increased length of the recoil path as in the case of radium. The initial increase in the ratio may be explained by the fact that the density of the ions decreases with decrease of pressure, and, therefore that there is less chance for the rest-atoms to recombine. Russ also tried experiments with small parallel plates for electrodes. These were placed at different distances above a preparation of actinium and it was found that the percentage of the total active deposit collected on the cathode increased as the plates were brought nearer the actinium. This was doubtless due to the diffusion to the electrodes of different amounts of rest-atoms, which had become neutral in the region surrounding the electrodes outside the electric field.

Kennedy⁵ continued these investigations and obtained about the same results as Russ. He used as electrodes two parallel plates, circular in shape and surrounded by guard rings. These plates could be adjusted both as regards their distance apart and their distance above the actinium preparation. He found that the active deposit on each plate decreased as the distance from the actinium was increased, due to the decay of the actinium emanation. On keeping the distance from the actinium fixed and lowering the pressure, the active deposit on both plates first increased and then decreased. Similar effects were obtained in carbon dioxide and in hydrogen. All these results can be explained by the changes in the density of the emanation between the plates caused by the combined effects of diffusion and decay.

The behaviour of the active deposit of radium has also been investigated by Wellisch and Bronson.⁶ They used a cylindrical testing vessel and small central electrode, which was generally made the cathode. As the potential gradient was increased the percentage of the total active deposit collected on the cathode increased rapidly at low potentials and then more slowly until at an average potential gradient of about 1,500 volts per cm. this percentage was about 91.5

⁴ Russ, *Phil. Mag.*, June, 1908.

⁵ Kennedy, *Phil. Mag.*, Nov., 1909.

⁶ Wellisch and Bronson, *Am. Journ. Sci.*, May, 1912.

Even at this high potential gradient the percentage cathode activity seemed to be slowly increasing. The shape of the curve showing the relationship between the percentage cathode activity and the potential gradient was shown to be very similar to the saturation curve (ionization current-voltage curve), when the ionization was due to α rays. The similarity of these two curves was also pointed out by Schmidt.⁷ This similarity would indicate that the rest-atoms are subject to recombination with negative ions, just as are positive ions.

Continuing the investigation Wellisch⁸ found that a limiting value was apparently reached for the percentage cathode activity with increasing potential gradients. He gave later⁹ a corrected value of 88.2% for this limit, when the emanation was in dry air. In carbon dioxide and in hydrogen the corresponding limits were 78.9% and 88.2%. Wellisch also showed that no appreciable fraction of the rest-atoms were negatively charged, and that in ether vapor all the rest-atoms were uncharged. He further found the coefficient of diffusion of uncharged rest-atoms in dry air to be approximately the same as that of gaseous ions.

Eckmann¹⁰ had previously obtained a value for the coefficient of diffusion of the rest-atoms in good agreement with that found by Wellisch. Eckmann, however, came to the conclusion that in air, about 98% of the rest-atoms are positively charged, and the remaining 2% negatively charged. This 2% was doubtless due to the diffusion of uncharged rest-atoms to the anode, since Wellisch has clearly shown that no negatively charged rest-atoms are present. Eckmann used a cylindrical testing vessel, but assumed that the total active deposit was the sum of the deposits obtained on the central electrode when it was first made cathode and then anode. He thus neglected the uncharged rest-atoms which diffused to the comparatively large cylindrical case. His value of 98% for the positively charged rest-atoms is therefore considerably too large.

The behaviour of the active deposit of actinium was investigated by Walmsley.¹¹ He came to the conclusion that all the actinium rest-atoms are positively charged. As his procedure was similar to that of Eckmann, he also failed to take account of the active deposit collected on the case. Hence his value of 100 for the percentage cathode activity is probably too high.

⁷ Schmidt, *Phys. Zeit.*, 9, p. 184, 1908.

⁸ Wellisch, *Am. Journ. Sci.*, Oct., 1913.

⁹ Wellisch, *Am. Journ. Sci.*, Oct., 1914.

¹⁰ Eckmann, *Jahr. der Radioakt.*, May, 1912.

¹¹ Walmsley, *Phil. Mag.*, Sept., 1913.

Lucian,¹² on taking account of the active deposit on the case obtained results for actinium very similar to those obtained by Wellsch for radium. He came to the conclusion that a limiting value of 94.9 was reached for the percentage cathode activity of actinium in dry air.

The behaviour of radium was also studied by Walmsley.¹³ Using a cylindrical type of vessel, he also proved that no negatively charged rest-atoms of radium exist, and that even at the highest potential gradients the activity of the central rod when anode was about 2.7% of that when the rod was cathode. His figures seem to indicate that roughly about 10% of the rest-atoms was uncharged, when account is taken of those collected on the case.

The results obtained by these investigators differed from one another so widely that it was not clearly established whether any definite fraction of the rest-atoms of radium was initially uncharged, or if partly uncharged what the value of this fraction was. A similar statement would hold true for actinium and also for thorium, though little work had been done with the latter.

DISCUSSION OF APPARATUS.

In many of the experiments referred to above a considerable source of error is probably to be found in faulty design of the testing vessel. In the ideal testing vessel the following conditions should hold:

1. The field should be uniform.
2. All the rest-atoms should settle on the electrodes and none on other parts of the vessel, where they would remain unmeasured.
3. There should be no opportunity for rest-atoms, neutralized by recombination outside the field, or in a weak field, to diffuse to the electrodes.
4. The electrodes should not be so close together as to make the effect of recoil too great.
5. The active deposits collected on the electrodes should be measured under identical conditions.

The field in a cylindrical testing vessel is far from uniform. A simple calculation will show this. Assuming no ionization within

¹² Lucian, *Am. Journ. Sci.*, Dec., 1914.

¹³ Walmsley, *Phil. Mag.*, Oct., 1914.

the testing vessel, the potential gradient at a point distant r from the axis of the vessel is

$$\frac{V}{r \log \frac{r_2}{r_1}}$$

where r_1 and r_2 are the radii of rod and case and V is the difference of potential between them.

For example in the vessel generally used by Wellisch $r_1 = .0915$ cm., $r_2 = 2.90$ cm. If the difference of potential between rod and case is 1,000 volts, then it can readily be calculated that:

The potential gradient near the rod = 1890 volts per cm..

" " " " " case = 60 " " "

" " " midway between rod and case = 116 volts per cm.

The effect of ionization in the vessel would be to increase the potential gradients near the electrodes, particularly near the central electrode. Hence the potential gradient in the body of the vessel would be correspondingly decreased. Thus it is evident that the potential gradient in a large fraction of the volume of the vessel is very weak compared with what it would be if the field were uniform. The presence of insulating material in the plug holding the rod also tends to distort and weaken the field near it. To make matters still worse, there is a considerable region in the corners formed at either end of the vessel between the cylindrical side and the ends, where the field is much weaker than in any other part of the vessel, thus greatly increasing the chance of recombination of the rest-atoms.

Another objection to the cylindrical type of vessel is that a small part at least of the total activity will be deposited on the insulating material and remain unmeasured. Furthermore, of the rest-atoms to be measured part are on the rod while part are on the case, so that the ionizations produced are not proportional to the number of the rest-atoms present in the two cases.

The parallel plate type of vessel used by Kennedy⁵ fulfilled much more nearly the required conditions, but opportunity still existed for recombined rest-atoms to diffuse up between the plates. The effect of recoil was also considerable.

It is hoped that the type of vessel finally adopted by the writer and used in the final experiments with radium satisfies all these requirements. A brief description is here given. The vessel is shown in plan and elevation in Fig. 1. The electrodes A and B were two

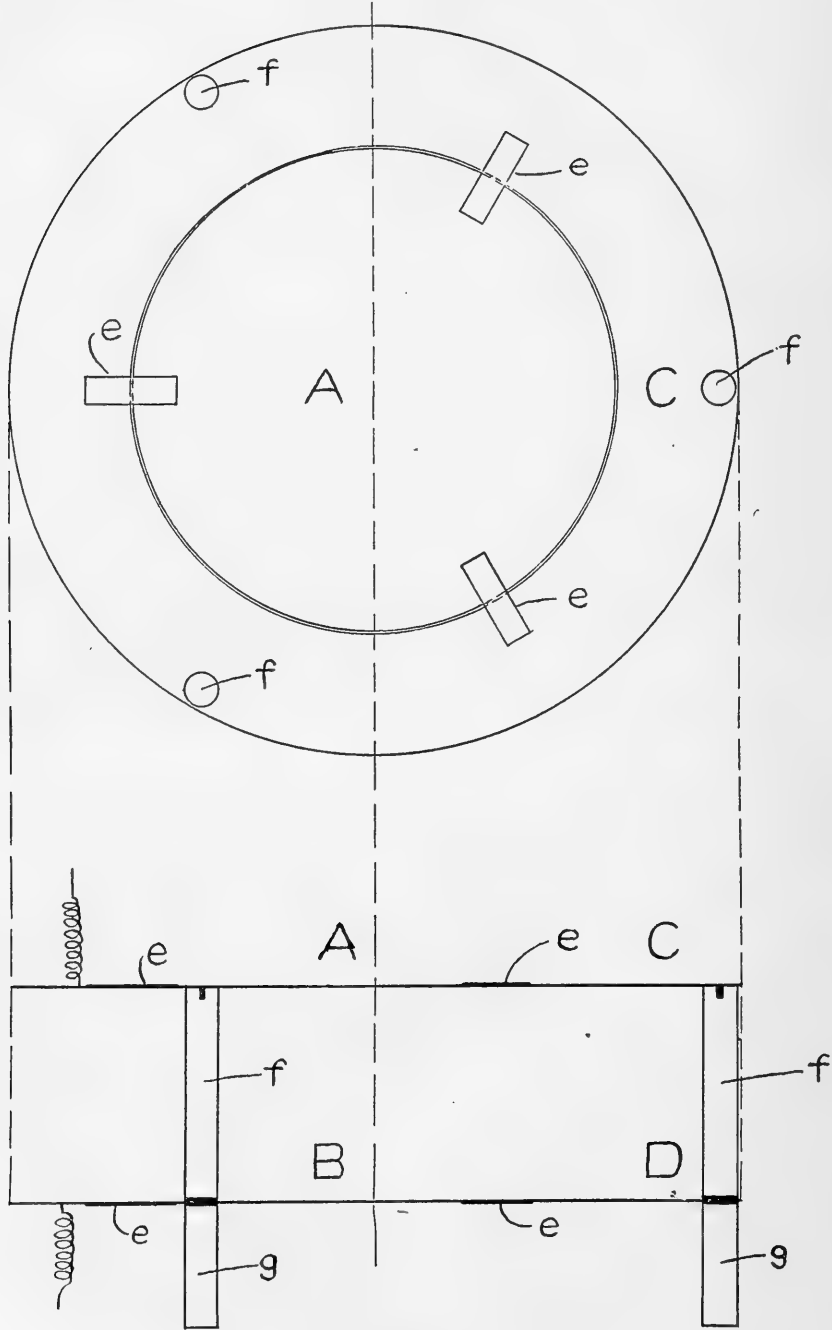


Figure 1.

circular brass plates, 7.00 cm. in diameter, supported in guard rings C and D by small lugs e fixed to A and D. The guard rings were of 7.10 cm. internal and 10.5 cm. external diameter and were also of brass. The guard rings C and D were held parallel at about 3 cm. from one another by three glass rods f. The glass legs g supported the whole on the plate of an air pump, to which the lower plate was electrically connected. A bell jar of internal diameter 11.5 cm. fitted over the plates. To prevent diffusion of rest-atoms from above or below the plates cotton wadding was placed over C and under D to close up the small space between the rim of the guard ring and the bell jar. Connection to the upper plate was made by a wire passing through the top of the bell jar. In filling the bell jar with the required gas, the bell jar was exhausted to 1 or 2 mm. pressure and the gas was then allowed to pass in through a tube of Ca Cl_2 and a tube of P_2O_5 . The bell jar was again exhausted and the gas allowed to enter a second time. The radium preparation and two small dishes containing P_2O_5 were always kept in the bell jar, being placed above A. In this condition the apparatus was allowed to stand from 12 to 24 hours to allow sufficient emanation to collect. The rods f and the outside edges of the guard rings were coated with paraffin to prevent electrical discharge, but no insulating material was near the field between A and B. The active deposits on both plates were measured in an α ray electroscope under identical conditions.*

EXPERIMENTS WITH THORIUM.

The active deposit of thorium, which had received the least attention, was first investigated by the writer.¹⁴ Experiments were carried out not only in dry air but also in air mixed with vapors and in some pure gases and vapors. It was found possible in dry air to concentrate all the rest-atoms on the cathode. The behaviour of thorium is in this regard in striking contrast with that previously found in the case of radium by Wellisch and others.

The effect of the water vapor in the air was to lower the fraction of the rest-atoms which was concentrated on the cathode in a given field. A similar result was obtained by Wellisch in the case of radium. Experiments with different relative amounts of air and water vapor seemed to indicate that in an atmosphere of water vapor alone all the rest-atoms of thorium would be uncharged.

In ether vapor all the active deposit particles were found to be uncharged. An entirely similar result was found by Wellisch in the

*For further particulars as to apparatus and manipulation, see a recent paper by the writer, *Trans. N.S. Inst. Sci.* vol. XIV., pt. 1, p. 123.

¹⁴ Henderson, *Trans. N.S., Inst. Sci.*, XIV pt. 1, p. 1.

case of radium. In a mixed atmosphere of ether vapor and air, at a given potential, the fraction of the thorium rest-atoms collected on the cathode depended on the relative proportions of air and ether vapor. In a given mixture of ether vapor and air the fraction of the rest-atoms which could be collected on the cathode seemed to reach a definite limiting value as the potential gradient was increased.

In oxygen 98.5% of the total active deposit was collected on the cathode with a potential gradient of only 40 volts per cm. It seemed quite evident that at a sufficiently high potential gradient all the active deposit could be collected on the cathode. In carbon dioxide, with a potential gradient of only 150 volts per cm. 98.0% of the total active deposit was collected on the cathode. As this percentage was steadily rising with increase of potential gradient up to 150 volts per cm. it seemed reasonable to suppose that with a sufficiently strong field all the rest-atoms could be collected on the cathode. In sulphur dioxide at a potential gradient of 4,000 volts per cm. 98.5% of the total active deposit was collected on the cathode. As with carbon dioxide it appeared that with a high enough potential gradient all the rest-atoms could be collected on the cathode. On the other hand in ethyl bromide and in acetone vapors all the rest-atoms appeared to be uncharged just as in ether vapor.

Thus it will be seen that, in those experiments in which the atmosphere surrounding the rest-atoms consisted of molecules of one kind, the rest-atoms were either all positively charged or all neutral.

EXPERIMENTS WITH RADIUM.

The thought immediately suggested itself that the behaviour of the active deposit of radium in air might be due to the fact that air is a mixture, since it resembled the behaviour of the thorium rest-atoms in a mixed atmosphere. Experiments carried out in pure nitrogen and in pure oxygen, however, gave approximately the same percentage cathode activities as in air, which disposed of this suggestion.

While continuing experiments in air and other gases, it was found that a much higher potential gradient was required to bring over to the cathode any percentage of radium rest-atoms than was needed to bring over the same percentage of thorium rest-atoms. A series of experiments was then made in dry air using high potential gradients. Above a gradient of 150 volts per cm. the potential were furnished by a Wimshurst machine. The results obtained are given in Table I. The first column gives the potential gradient in volts per cm. The second gives the percentage cathode activity, i.e., the percentage

of the total activity collected by the cathode. The percentage of the total positively charged is obtained by subtracting from 100 twice the percentage found on the anode, as there is also deposited on the cathode by diffusion an amount of activity equal to that deposited on the anode.

TABLE I.

Volts per cm.	Percentage. Cathode Activity.
13	92.7
25	93.5
80	94.8
150	94.9
1,000	96.2
2,000	96.4
4,000	96.9
12,000	97.8

A few experiments were carried out in hydrogen, carbon dioxide and sulphur dioxide, with the results shown in Table II.

TABLE II.

Volts per cm.	Percentage Cathode Activity		
	H ₂	CO ₂	SO ₂
150	95.3	89.9	—
4,000	96.2	93.1	93.2
12,700	—	93.9	—

The results obtained in air show how much more difficult it is to bring over to the cathode the rest-atoms of radium than of thorium, under similar conditions. To obtain 97.8% of the thorium rest-atoms on the cathode a potential gradient of only about 30 volts per cm. would be required, compared with a potential gradient of 12,000 volts per cm. in the case of radium. The ionization between the plates was of the same order of magnitude in the two cases. At the higher potential gradient a considerably larger percentage was found positively charged than the results of Wellisch would indicate, and there appeared to be no limiting value to the percentage brought over to the cathode, but as the potential gradient was increased this percentage gradually though slowly increased. Thus, in spite

of the contradictory evidence of Wellisch, one seems justified in concluding that all the rest-atoms could be brought to the cathode in a sufficiently strong field and hence that all the rest-atoms of radium are initially positively charged.

In hydrogen at a potential gradient of 150 volts per cm. a larger percentage of the rest-atoms was collected on the cathode than in air, while at 4,000 volts per cm. a smaller percentage was collected in hydrogen than in air. With this intense electrical field it is difficult to completely eliminate brush discharge. This would produce water vapor by causing the hydrogen to combine with the traces of oxygen present. That some moisture was present seemed evident from the fact that the P_2O_5 in the vessel was affected to a much greater extent in hydrogen under a high potential gradient than in hydrogen under low potential gradients, or in any other gas tried, though the same precautions were taken in all cases to dry the gas before admitting it to the vessel. Small quantities of moisture are known to lower considerably the percentage cathode activity. This would seem to explain the low values of this percentage found in hydrogen with high potential gradients. If the effect of moisture could be eliminated it seems probable that a higher percentage cathode activity would be obtained in hydrogen than in air at all potential gradients. In hydrogen as in air the conclusion seems justified that the rest-atoms are all initially positively charged.

In carbon dioxide and in sulphur dioxide it is much more difficult to bring the rest-atoms over to the cathode than in air. It will be noticed that both carbon dioxide and sulphur dioxide are, at room temperatures, either vapors or on the border line between vapors and gases. To see if any abrupt change in the behaviour of the rest-atoms takes place near the critical temperature, experiments were carried out in carbon dioxide at temperatures of about $4^\circ C$., $19^\circ C$ and $36^\circ C$. It seemed a little more difficult to bring the rest-atoms over to the cathode at the lowest temperature but the difference was very slight. The fact that the percentage cathode activity is increasing so slowly when it is as low as 93%, perhaps should make one hesitate to conclude that with a sufficiently high potential gradient, all the rest-atoms could be collected on the cathode. However, it seems unnatural to suggest any other limit than 100% for the percentage cathode activity, especially in view of the fact that with the highest obtainable voltages the percentage was still increasing. Therefore, in the absence of contradictory evidence, it does not seem unreasonable to conclude that in sulphur dioxide and in carbon dioxide all the rest-atoms of radium are initially positively charged. This brings the behaviour of the radium rest-atoms in agreement

with those of thorium rest-atoms and is also in accord with the ideas advanced in the latter portion of this paper.

DISCUSSION AND EXPLANATION OF CURVES.

The results for dry air, as given in Table I, are shown graphically in Fig. 2. If this curve be examined, it can readily be divided into

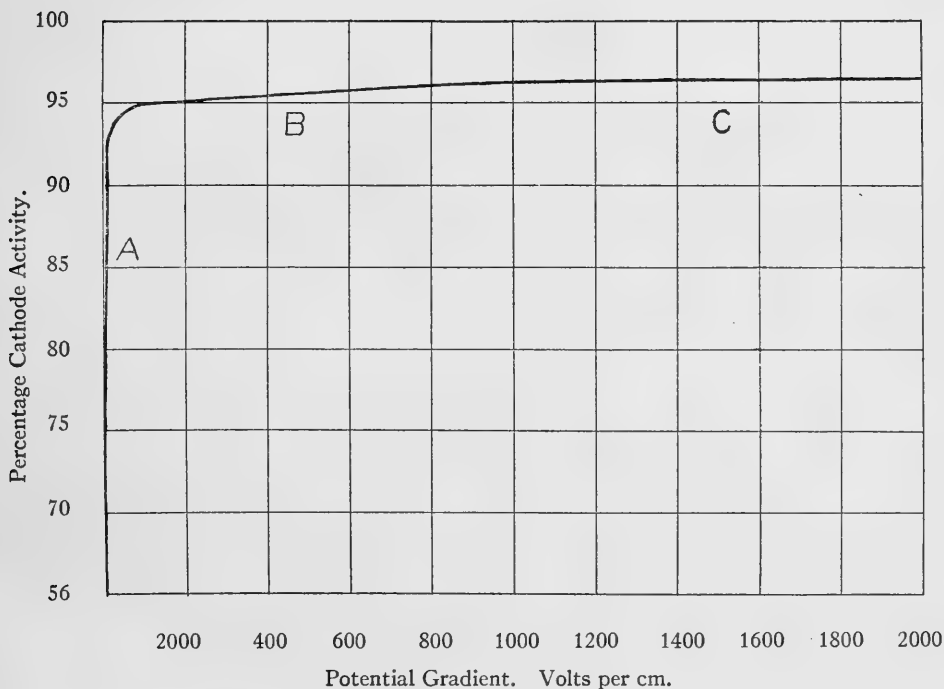


Figure 2.

three parts, A, B, and C, each of which has a distinctly separate slope. The part A is very steep. It represents that condition in which the potential gradient is not sufficient to prevent the rest-atoms from combining with negative ions in the body of the gas. If the field were entirely absent, this recombination would go on till all the rest-atoms were neutral. The rest-atoms would diffuse equally to both plates and the curve would cut the axis of ordinates at 50%. The application of a weak field easily prevents this volume recombination and, as is evident from the curve, at a potential gradient of about 75 volts per cm. the volume recombination has been practically prevented. It might be remarked that the transition from the part A to B is more abrupt when the experiments are carried out with parallel plate vessels than when carried out with cylindrical vessels,

on account of the more uniform field of the former. In the latter vessels, while volume recombination might be prevented close to the rod, it might still be effective nearer the case.

The second part B of the curve represents that condition in which the field is sufficient to eliminate volume recombination, but only partially prevents combination of the rest-atoms with the ions in the dense column of ions formed by the rest-atoms on recoil. This columnar recombination is much harder to eliminate than the volume recombination on account of the density of the ions within the column, and particularly so when the columns are formed parallel to the field. The greater difficulty of preventing columnar recombination is shown by the smaller slope, which appears to be about 3% per 1000 volts.

By the time a potential gradient of not over 1,000 volts per cm. is reached, however, the columnar recombination seems to be practically eliminated. (It is to be regretted that it was not possible with the facilities available to obtain potential gradients between 150 and 1,000 volts per cm.) The curve then makes another bend and the part C is entered upon. This part of the curve appears to have a slope of about 0.3% per 1,000 volts, only 1/10 of the slope of part B. Only two points on this portion of the curve fall within the limits of Fig. 2, but this curve C, if produced, would pass through the remaining points given in Table I.

The following possible physical explanation can be offered for the third part of the curve. The radium rest-atom on recoil produces a dense column of ions by collision with the molecules of the gas and is rapidly brought to rest, whereupon it can come under the influence of the field. Now just as the rest-atom is at the end of its recoil path it may not succeed in completely disengaging itself from the last molecule which it ionizes, but may remain within the influence of this particular molecule. Under these circumstances the problem of preventing recombination is no longer the statistical one of preventing recombination with some one of the dense group of ions forming the column but with one particular ion separated from the rest-atom by a distance of a smaller order of magnitude than even the distances between the ions in the column. That is, instead of depending on the density of the ions as in the cases of volume and columnar ionization the problem depends upon the distance between the rest-atom and one particular ion; and an electric field of a different order of magnitude would be required to effect the separation. This would explain the smaller slope of the third part of the curve. The fraction of the rest-atoms which find themselves within this sphere of influence naturally depends upon the nature of the last molecule with which the rest-atom comes in contact. One would expect that the larger

and more complex the molecules of the gas, e.g., CO_2 , the greater will be the percentage of rest-atoms which fall within the influences which determine the third part of the curve. This would explain why different apparent limiting values for the percentage cathode activity in different gases were found by Wellisch and others when they used potential gradients too low to detect the slope of the third part of the curve.

This type of recombination closely resembles the initial recombination, first conceived by Bragg¹⁵ to account for the lack of saturation of the ionization current produced by α rays. Accordingly the same term will be used to designate the type of recombination represented by the third part of the curve.

It is well known that the behaviour of radium rest-atoms in air under the action of an electric field is very similar to that of ions. The curve in Fig. 2 is made up of three parts, A, B and C and the explanation has been offered that these parts are due respectively to volume, columnar and initial recombination. It is well known that parts corresponding to A and B are found on the ionization current—voltage curve for air ionized by α rays. These have been previously shown to be due to volume and columnar recombination. It seems reasonable to suppose that initial recombination between ions also takes place. Attempts have been made by previous investigators, as Wheelock,¹⁶ to show that initial recombination exists but little evidence that such was the case could be obtained from their curves, although initial recombination between ions should make itself evident by the existence of a third part (corresponding to C) on the saturation curve for ionization due to α rays. That is the familiar “saturation” curve does not represent saturation at all; the supposedly flat portion of the curve having really a small slope. That such has not been found may be due to two causes. The effect may be obscured by ionization by collision, before potential gradients high enough to even partially prevent initial recombination have been reached. Also it is impossible to tell what is the true value of the saturation current and hence there is no way of telling how far the ionization current for any particular potential gradient falls below that value.

THE BEHAVIOUR OF ACTINIUM.

Some evidence as regards the behaviour of actinium can be obtained from the results of Kennedy,⁵ obtained using parallel plates as

¹⁵ Bragg, *Phil. Mag.*, XI, p. 466, 1906.

¹⁶ Wheelock, *Am. Jour. Sci.*, Oct., 1910.

electrodes. In one case he maintained his plates 2 mm. apart and 11 mm. above a preparation of actinium, and had a potential difference of 250 volts between the plates. He measured the distribution of the active deposit under different pressures, obtaining results shown in the first two columns of Table III.

TABLE III.

Pressure in mm.	Fraction p of total activity on anode.	Fraction p_1 .	Corrected fraction on anode.	Percentage Cathode Activity.
135	.064	.046	.018	98.2
192	.043	.032	.011	98.9
220	.027	.019	.008	99.2
500	.022	.012	.010	99.0
750	.021	.008	.013	98.7

It is evident that with the plates so close together, recoil will play an important part, particularly at low pressures. The fraction p_1 of the total activity deposited on the anode by recoil is given by

$p_1 = \frac{R^{17}}{4d}$ where R is the average range of the rest-atoms and d is the distance between the plates. The values of p_1 given in column 3 have been calculated assuming an approximate value of .065 mm. for the average range of actinium rest-atoms in air at atmospheric pressure. The differences between p and p_1 are given in column 4. They represent the fractions of the total activity which settled on the anode by diffusion. The values in column 5 are calculated as in the case of radium. As the pressure is lowered below one atmosphere, the percentage cathode activity at first increases and then decreases. The first rise is due doubtless to the increased effectiveness of the potential gradient at lower pressures owing to the smaller density of the ions. At still lower pressures, however, there is more opportunity for neutralized rest-atoms to diffuse between the plates and be deposited on the anode. To this can probably be ascribed the later fall of the percentage cathode activity. That this effect may become great can be seen from some experiments of Kennedy's in which the plates 2 mm. apart were placed 1.3 mm above the actinium preparation. Even with a potential difference of 1,150 volts only 60% of the total activity was found on the cathode.

Turning to Table III, we see that under a potential gradient of 1,250 volts per cm., 98.7% of the actinium rest-atoms are collected

¹⁷ Rutherford, R.A. Substances and their Radiations, p. 404

on the cathode in air at atmospheric pressure. The conclusion seems justified that with a sufficiently high potential gradient all the rest-atoms of actinium could be concentrated on the cathode. The fact that Lucian, using cylindrical vessels, came to the conclusion that a limiting value of about 95% was reached only serves to emphasize the unsuitability of this type of vessel.

THEORETICAL DISCUSSION.

So far this paper has dealt only with rest-atoms after they have reached the end of recoil, and no suggestion has been made, which would in any way explain their "initial" charged or uncharged condition. The word "initial" as used in this connection does not apply to the rest-atom at the instant the α particle is separated from the emanation atom, but rather to the instant when it has reached the end of its recoil path, for it is only then that even the strongest external field can exert an appreciable effect. However, the mechanism responsible for its initial charged condition is of considerable theoretical interest and has been much discussed since it was first discovered that the active deposits were largely collected on the cathode in spite of the fact that the rest-atom is produced when an emanation atom loses a positively charged α particle. It is felt that the present investigation throws much light on this much discussed subject. In the first place the experiments on thorium rest-atoms in air, ether, and a mixture of the two, show conclusively that the initial positive or neutral condition of the rest-atom does not depend on what happens on the break up of the emanation atom, but rather upon the nature of the atoms met during recoil. In the second place it has been shown that the fraction of the rest-atoms initially neutral in a mixture of air and ether depends upon the *relative* amount of ether present, not merely on the *absolute* amount present. This can only mean that both air and ether molecules exert on the recoiling rest-atom some definite influence. It is not enough to assume that ether alone is an active agent, while the air is merely passive.

The following explanation of what takes place during recoil seems to satisfy both the above results. When a neutral rest-atom while recoiling meets a molecule of nitrogen or oxygen, for example, it not only ionizes the molecule of the gas, but itself as well, that is, an electron escapes from it and it goes on its way positively charged. Thus the rest-atom is always positively charged after collision with certain kinds of gas molecules. On the other hand after collision with certain other kinds of molecules, such as those of ether the rest-atom always escapes uncharged whether on meeting the molecule it is charged or not. If it meets such a molecule when positively

charged it not only ionizes the ether molecule but itself combines with the negative ion, thus becoming neutral. If, however, the rest-atom is uncharged when it meets the ether molecule, it ionizes the ether, but goes on its way unchanged. We thus see that the charged condition of the rest-atom at the end of recoil depends on the nature of the last atom which it succeeds in ionizing.

This does not seem surprising when one stops to consider that ionization implies high relative velocity between the ionizing and ionized bodies. In general the relative velocity is due to the motion of the smaller and more stable body, but this is not necessarily the case as is evident in the collision of the recoiling rest-atom with oxygen molecules. Under these circumstances the moving body may quite possibly be ionized as well as the molecule which it strikes. If on the other hand a recoiling rest-atom meets a large complex molecule (e.g. an ether molecule) it may ionize the latter without being itself ionized. Of course the experimental facts could be equally well explained by assuming that the rest-atom was only affected by the last collision. However, this assumption seems less natural.

In the above discussion nothing has been said regarding the charge carried by the rest-atom at the instant it is formed from the emanation, because it can not possibly affect the problem, unless the rest-atom is not only negative at birth, but on recoil only collides with ether molecules. Under these circumstances it might still be negative at the end of the recoil and would therefore be collected on the anode. It would, however, be ionized and become neutral or positive on collision with a single air molecule. Removal of the air completely enough to avoid such a collision is practically impossible in these experiments.

The question might possibly arise whether a gas might not be found in which the rest-atoms would all be initially negatively charged. This seems very unlikely as it would mean that the rest-atom would in reality have to become a large negative ion in its recoil through the gas, and we expect to find such large negative ions only in the case of aggregates.

CONCLUSIONS.

1. The conditions which should hold in an ideal testing vessel for this work have been discussed. It has been shown that the cylindrical type of vessel used by many investigators does not satisfactorily fulfill those conditions. A parallel plate type of vessel which does fulfill those conditions has been described.

2. All the available data indicates that the rest-atoms of radium, thorium and actinium are affected similarly by the surrounding gas and behave similarly in electric fields. The slight differences, which do exist, are differences of degree and not of kind.

3. The rest-atoms were found to be initially all charged alike, either all positive or all neutral, when surrounded by molecules of a single kind. In air, hydrogen, oxygen, carbon dioxide, etc., the rest-atoms are initially all positively charged. In ether, water vapor, ethyl bromide, etc., the rest-atoms are initially all neutral. In atmospheres containing molecules of both types, the fraction of the rest-atoms positively charged depends on the relative numbers of the two kinds of gas molecules present.

4. The recombination between rest-atoms and ions has been shown to consist of three distinct types, "volume," "columnar" and "initial." It has been pointed out that not only volume and columnar but also initial recombination should take place between ions themselves.

5. A possible explanation of what takes place during recoil, has been advanced to account for the initial charged conditions of the rest-atoms in atmospheres composed of a single gas and of a mixture of two gases.

I take this opportunity to express my gratitude to Prof. H. L. Bronson for his continual interest and advice throughout this investigation and without whose help this paper could not have been completed.



Human Adipocere.

By R. F. RUTTAN, M.D., D.Sc.

(Read May Meeting, 1916.)

(ABSTRACT).

A study of two specimens of human adipocere is reported, one from the abdomen and legs of the body of an unknown woman found in the St. Lawrence River near Montreal, and the other from the body of an exhumed Chinaman buried for five years in the Mount Royal Cemetery, Montreal.

The body of the woman showed uneven conversion to adipocere, some portions were soft and oily, others dry and firm. Separate studies were made of this mature and immature adipocere. The average of several determinations showing close agreement are tabulated in columns II and III below and in column I the physical and chemical constants of a sample of mature pig's adipocere (see Abstracts of Proceedings of the Society of Biological Chemists for 1915) are recorded for comparison. The study of the adipocere from the other case referred to gave results very similar to those in column II, but the analysis is not yet complete.

COMPOSITION OF ADIPOCERE.

TABULATED RESULTS OF ANALYSIS OF HUMAN AND PIG'S ADIPOCERE.

	I. Pigs. (Mature).	II. Human. Hard.	III. Human. Soft.
Ether Soluble.....	94.1%	82.9%	75.8%
Specific gravity at 100°C.....	.8436	.8397	.8410
Refractive Index 65°C.....	1.436	1.437	1.439
Melting Point.....	60-63°	52-54°	50-51°
Acid Value.....	201.7	207.3	203.8
Saponification Value.....	207.0	211.0	212.2
Iodine Value.....	6.04	9.65	12.52
Acetyl Value.....	34.75	11.8	—
Mean Mol. Wt.....	271.0	266.0	264.0
Saturated Fat Acids.....	70.82%	71.78%	59.2%
Unsaturated Fat Acids.....	5.24	8.87	11.6
Hydroxy Fat Acids.....	14.80	8.24	7.8
Stearin and Palmitin.....	1.21	0.91	0.90
Olein.....	0.16	0.15	0.83
Unsaponified Matter.....	0.87	0.69	0.75
Calcium soaps.....	4.41	6.76	12.3
Protein.....	0.665	1.93	4.14
Ammonia.....	0.035	.....	0.054
Ash.....	0.574	1.99	2.25

These results show the remarkable similarity in composition of adipocere from different animals and in different stages of maturity.

1. A dipocere is essentially composed of saturated solid fatty acids, glycerides being present in traces only.

2. The soft and immature adipocere differs from the waxy variety in carrying more oleic acid, proteins (soft connective tissue and hyaline muscular fibres), and lime soaps.

3. Adipocere whether mature or immature contains the same two monohydroxystearic acids reported by the author† as present in the waxy pig's adipocere. One prismatic acid, *iota* hydroxystearic, melting at 84.5° and the other theta hydroxystearic acid, in rhombic plates melting at 78.4° .

4. These isomeric hydroxystearic acids are derived from oleic acid by the introduction of a molecule of water where the double bond occurs in the middle of the molecule.

5. The hydration of oleic acid to the hard hydroxystearic acids and the disappearance of unaltered oleic acid mark the final stages in the formation of mature adipocere.

6. Complete hydrolysis of fat, under the conditions favourable for adipocere formation, occurs even in the presence of soft proteins (one analysis gave 8.9% protein as muscle fibre and connective tissues) and in the bone marrow which was found to be converted into calcium soaps and fat acids with traces only of glycerides. In no case could ammonia soaps be detected.

7. Adipocere should be regarded as the product of the hydrolysis of fats by water where the time factor and the concentration of the reacting water are almost indefinitely great and where the soluble product glycerol is rapidly removed. It seems to the author that bacterial and enzymic action and the formation of soluble soaps play a quite secondary part in the development of adipocere from fats. The hard waxy character of the mature substance is largely due to the presence of the two hydroxystearic acids. Calcium soaps, proteins, etc., are variable incidental components.

Department of Chemistry,
McGill University.

†Journal of Biological Chemistry, March 1917.

Alternate Numbers as Geometrical Indices.

BY J. C. GLASHAN, LL.D., F.R.S.C.

(Read May Meeting, 1916).

In the following paper, symbols printed in Clarendon type denote geometrical points, lines, angles and figures.

1. If **A** and **B**, two points on the endless line **l**, divide **l** into segments (**l**) and **l**(, and if **P** be a point on (**l**), then **AB** will denote **l** considered as described through **A**, **P** and **B** in the order **A**, **P**, **B**; and **BA** will denote the same line considered as described through the same three points but in reverse order, viz., **B**, **P**, **A**. Also (**AB**) will denote the segment (**l**) considered as described from **A** through **P** to **B**; and (**BA**) will denote the same segment considered as described from **B** through **P** to **A**. If **P** and **Q** are two points on the segment (**AB**), the segments (**AP**) and (**QB**) are said to be condirectional and the lines **AP** and **QB** to be coincident; also the segments (**AP**) and (**BQ**) are said to be contradirectional and the lines **AP** and **BQ** to be contraincident. If **R** is a point on **AB** so taken that (**AB**) and (**BR**) are condirectional, **R** is said to lie on (**AB**) produced. The segment '(**AB**) produced' may be denoted by **A**) (**B**+.

The straight line is an endless line with *one* given point on it, the point at infinity. Since the point at infinity must lie either on (**l**) or on **l**(, provided it is not one of the determining points of these segments, its location will serve to distinguish between the two segments. If it lie on **l**(, the points on (**l**) are said to lie *between* the determining points of (**l**). If **A** and **B** cut the straight line **l** into the segments (**AB**) and **A**) (**B**, it will hereafter be taken for granted unless otherwise specifically stated, that the point at infinity lies on **A**) (**B**, cutting that segment into two segments **A**) (**B**+ and, + **A**) (**B**.

2. If the lines **a** and **d** intersect, the point of intersection will be denoted by **ad**; if the lines **AB** and **CD** intersect, the point of intersection will be denoted by **AB . CD**. The endless line through **ab** and **cd** will be denoted by **ab | cd**, and the segment from **ab** to **cd** by (**ab | cd**). If the points **A**, **B** and **C** are collinear, their line of collimation will be denoted by **A | B | C**. If the lines **a**, **b** and **c** are concurrent, their common point will be denoted by **a . b . c**.

3. If the straight lines **AB** and **CD** intersect at **O**, the angle described by the radian **OR** turning counter-clockwise on the pole

O, from coincidence with **AB** to coincidence with **CD** will be denoted by $\angle \mathbf{AB} \angle \mathbf{CD}$; if the total rotation is less than a complete revolution, the angle will be denoted by $(\angle \mathbf{AB} \angle \mathbf{CD})$. If **OR** turn clockwise on **O** from coincidence with **CD** to coincidence with **AB**, the angle so described will be denoted by $\mathbf{CD} - \angle \mathbf{AB}$, or by $(\mathbf{CD} - \angle \mathbf{AB})$ if the total rotation is less than a complete revolution. If **A**, **C** and **O** coincide, the angle $(\angle \mathbf{OB} \angle \mathbf{OD})$ may be denoted by $(\angle \mathbf{BOD})$.

4. The triangular figure formed by the three points **A**, **B**, **C** and the three lines **AB**, **BC**, **CA**, will be denoted by **ABC** or by *abc*, wherein $\mathbf{a} = \mathbf{BC}$, $\mathbf{b} = \mathbf{CA}$ and $\mathbf{c} = \mathbf{AB}$. Also **(ABC)** will denote the triangle with perimeter **(AB)**, **(BC)**, **(CA)**, the perimeter being described from **A** through **B** to **C**, thence along **(CA)** to **A**; and **(ACB)** will denote the same triangle but with perimeter described from **A** through **C** to **B** thence along **(BA)** to **A**.

5. The tetrastigm (complete quadrangle) formed by four coplanar points **A**, **B**, **C**, **D**, their six connecting lines $\mathbf{a} = \mathbf{BC}$, $\mathbf{b} = \mathbf{CA}$, $\mathbf{c} = \mathbf{AB}$, $\mathbf{a}' = \mathbf{AD}$, $\mathbf{b}' = \mathbf{BD}$, $\mathbf{c}' = \mathbf{CD}$, and the Cevan points $\mathbf{A}' = \mathbf{aa}'$, $\mathbf{B}' = \mathbf{bb}'$, $\mathbf{C}' = \mathbf{cc}'$ will be denoted by **ABC; D**. The tetragram (complete quadrilateral) formed by four coplanar lines **a**, **b**, **c**, **d**, their six intersection points $\mathbf{A} = \mathbf{bc}$, $\mathbf{B} = \mathbf{ca}$, $\mathbf{C} = \mathbf{ab}$, $\mathbf{A}'' = \mathbf{ad}$, $\mathbf{B}'' = \mathbf{bd}$, $\mathbf{C}'' = \mathbf{cd}$, and the diagonal lines $\mathbf{a}'' = \mathbf{AA}''$, $\mathbf{b}'' = \mathbf{BB}''$, $\mathbf{c}'' = \mathbf{CC}''$ will be denoted by *abc; d*. **A''**, **B''** and **C''** are the Menelaän points of *abc; d*.

6. The numeric of a geometrical magnitude is the numerical measure of the magnitude affected with the positive or the negative sign as the case may require. Thus, if ρ denote the numerical measure of the length of the line-segment **(I)** terminated by the points **A** and **B**, and if $+\rho$ be chosen as the numeric of the directed segment **(AB)**, $-\rho$ will be the numeric of **(BA)**. If θ denote the numerical measure of the rotation of the radian **OR** from coincidence with **OB** to first coincidence with **OD**, and if $+\theta$ be selected as the numeric of $(\angle \mathbf{OB} \angle \mathbf{OD})$, $-\theta$ will be the numeric of $(\mathbf{OD} - \angle \mathbf{OB})$. If Δ denote the numerical measure of the area of the triangle with angular points **A**, **B** and **C**, and if $+\Delta$ be selected as the numeric of **(ABC)**, then will $-\Delta$ be the numeric of **(ACB)**.

7. Symbols printed in italic type denote the numerics of the magnitudes of the geometrical figures denoted by the similar symbols in Clarendon type, parentheses that would be superfluous in the italics being omitted. Thus *AB* is the numeric of **(AB)**, *BA* is the numeric of **(BA)**; $(\mathbf{AB} \angle \mathbf{CD})$ is the numeric of $(\angle \mathbf{AB} \angle \mathbf{CD})$, and *ABC* is the numeric of **(ABC)**; but $\sin QOR$ means $\sin (\angle QOR)$ and simi-

larly for the other trigonometrical functions. In the case of the triangle, A will be used for $(\angle BAC)$, B for $(\angle CBA)$, C for $(\angle ACB)$, a for BC , b for CA , c for AB and Δ for ABC .

8. Geometrical indices are entities subject to the laws of commutation and association for addition, to the law of the distribution of a multiplier of a sum over the addends of that sum, and to the law of the association of the factors of a product all of whose factors are absolutely independent of each other; but they are not in general subject to the law of commutation for multiplication. Being heterogeneous with arithmetical numbers, they obey all the ordinary laws of addition and multiplication in their combinations with these. The indices of points and lines in any given plane are further assumed to be subject to the following postulates of combination and interrelation and their derived corollaries.

(i) Let ϵ_1, ϵ_2 be the indices of any two points P_1, P_2 , and η the index of the straight line P_1P_2 , we shall postulate

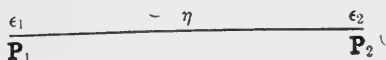
$$\epsilon_1\epsilon_2 = P_1P_2\eta$$

Cor. 1. Hence $\epsilon_2\epsilon_1 = P_2P_1\eta = -P_1P_2\eta$

$\therefore \epsilon_2\epsilon_1 = -\epsilon_1\epsilon_2.$

Cor. 2. Also $\epsilon_1^2 = P_1P_1\eta = 0$

\therefore for every point $\epsilon^2 = 0$.



(ii) Let η_1, η_2 be the indices of any two intersecting straight lines PP_1, PP_2 , ϵ the index of P , their point of intersection, and θ the numeric of $(\angle P_1PP_2)$, we shall postulate

$$\eta_1\eta_2 = \frac{1}{2} \sin \theta . \epsilon$$

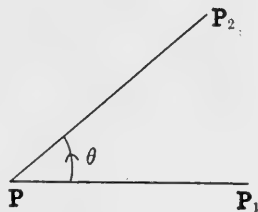
Cor. 1. Hence $\eta_2\eta_1 = \frac{1}{2} \sin (2\pi - \theta) . \epsilon = -\frac{1}{2} \sin \theta . \epsilon$

$\therefore \eta_2\eta_1 = -\eta_1\eta_2$

Cor. 2. Also $\eta_1^2 = \frac{1}{2} \sin 0 . \epsilon = 0$

$\therefore \eta_1^2 = 0$

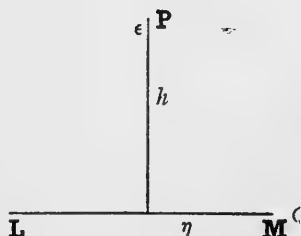
\therefore for every line $\eta^2 = 0$.



(iii) Let ϵ be the index of any point P , η the index of any straight line l , and h the numeric of the perpendicular distance of P from l , we shall postulate

$$\epsilon\eta = \frac{1}{2}h$$

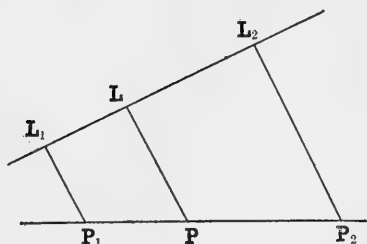
Cor. Let ϵ_1 and ϵ_2 be the indices of



any two points **L** and **M** on **l**, and r be the numeric of (**LM**), then since ϵ_1 and ϵ_2 are independent of ϵ and of each other,

$$\begin{aligned} r\epsilon\eta &= \epsilon(r\eta) = \epsilon(\epsilon_1\epsilon_2) = (\epsilon\epsilon_1)\epsilon_2 = -(\epsilon_1\epsilon)\epsilon_2 = -\epsilon_1(\epsilon\epsilon_2) \\ &= \epsilon_1(\epsilon_2\epsilon) = (\epsilon_1\epsilon_2)\epsilon = r\eta\epsilon \end{aligned}$$

$$\therefore \epsilon\eta = \eta\epsilon.$$



(iv) Let $\epsilon, \epsilon_1, \epsilon_2$ be the indices of three collinear points **P**, **P**₁, **P**₂, then will

$$\mathbf{P}_1\mathbf{P}_2\epsilon = \mathbf{P}\mathbf{P}_2\epsilon_1 + \mathbf{P}_1\mathbf{P}\epsilon_2$$

Draw any straight line **l** coplanar with **P**₁**P**₂, and on **l** let fall perpendiculars **PL**, **P**₁**L**₁ and **P**₂**L**₂, meeting **l** in **L**, **L**₁, **L**₂; let η be the index of **l**, and h, h_1, h_2 the numerics of (**PL**), (**P**₁**L**₁), (**P**₂**L**₂),

then will

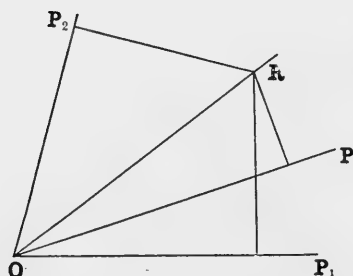
$$\begin{aligned} \mathbf{L}_1\mathbf{L}(h_1+h) + \mathbf{L}\mathbf{L}_2(h+h_2) &= (\mathbf{L}_1\mathbf{L} + \mathbf{L}\mathbf{L}_2)(h_1+h_2) \\ \therefore (\mathbf{L}_1\mathbf{L} + \mathbf{L}\mathbf{L}_2)h &= \mathbf{L}\mathbf{L}_2h_1 + \mathbf{L}_1\mathbf{L}h_2 \\ \text{i.e. } \mathbf{L}_1\mathbf{L}_2h &= \mathbf{L}\mathbf{L}_2h_1 + \mathbf{L}_1\mathbf{L}h_2 \\ \therefore \mathbf{P}_1\mathbf{P}_2h &= \mathbf{P}\mathbf{P}_2h_1 + \mathbf{P}_1\mathbf{P}h_2 \\ \therefore \mathbf{P}_1\mathbf{P}_2\epsilon\eta &= \mathbf{P}\mathbf{P}_2\epsilon_1\eta + \mathbf{P}_1\mathbf{P}\epsilon_2\eta \\ \therefore (\mathbf{P}_1\mathbf{P}_2\epsilon)\eta &= (\mathbf{P}\mathbf{P}_2\epsilon_1 + \mathbf{P}_1\mathbf{P}\epsilon_2)\eta \end{aligned}$$

Hence η being a variable independent of ϵ, ϵ_1 and ϵ_2 , we are justified in postulating

$$\mathbf{P}_1\mathbf{P}_2\epsilon = \mathbf{P}\mathbf{P}_2\epsilon_1 + \mathbf{P}_1\mathbf{P}\epsilon_2$$

(v) Let η, η_1, η_2 be the indices of three concurrent coplanar lines **OP**, **OP**₁ and **OP**₂, then will

$$\sin P_1OP_2.\eta = \sin POP_2.\eta_1 + \sin P_1OP.\eta_2$$



Let ϵ be the index of any point **R** in the plane of **P**₁**OP**₂, and h, h_1, h_2 be the numerics of the perpendicular distances of **R** from **OP**, **OP**₁ and **OP**₂ respectively, and let r be the numeric of (**OR**), then will

$$\begin{aligned} &\sin P_1OP_2 \sin POR \\ &= \sin POP_2 \cos P_1OP \sin POR \\ &\quad + \cos POP_2 \cos P_1OP \sin POR \end{aligned}$$

$$\begin{aligned} &= \sin POP_2 \sin P_1OP \cos POR + \sin POP_2 \cos P_1OP \sin POR \\ &\quad - \sin POP_2 \sin P_1OP \cos POR + \cos POP_2 \sin P_1OP \sin POR \\ &= \sin POP_2 \sin P_1OR + \sin P_1OP \sin P_2OR \end{aligned}$$

$$\therefore r \sin P_1OP_2 \sin POR = r \sin POP_2 \sin P_1OR + r \sin P_1OP \sin P_2OR$$

$$\therefore \sin P_1PO_2h = \sin POP_2h_1 + \sin P_1OPh_2$$

$$\therefore \sin P_1OP_2(\eta\epsilon) = \sin POP_2(\eta_1\epsilon) + \sin P_1OP(\eta_2\epsilon)$$

$$\therefore (\sin P_1OP_2 \cdot \eta)\epsilon = (\sin POP_2 \cdot \eta_1)\epsilon + (\sin P_1OP \cdot \eta_2)\epsilon$$

Hence ϵ being a variable independent of η , η_1 and η_2 , we are justified in postulating

$$\sin P_1OP_2 \cdot \eta = \sin POP_2 \cdot \eta_1 + \sin P_1OP \cdot \eta_2.$$

9. In the investigations and demonstrations which follow, the triangle of reference will be denoted by **ABC** or **abc**, ϵ_1 , ϵ_2 , ϵ_3 will denote the indices of **A**, **B** and **C** and η_1 , η_2 , η_3 the indices of **BC**, **CA** and **AB**. The phrases "index of **P**" and "index of **p**" will be abbreviated to "ind **P**" and "ind **p**". The word line, unless limited by a specifying adjective, will mean straight line.

10. I. Given the indices of the points **A**, **B** and **C**, to determine the index of any other point **D** in the plane of **ABC**.

Complete the tetrastigm **ABC**; **D** and let

$$\lambda : \mu : \nu : \lambda + \mu + \nu :: (\text{CDB}) : (\text{ADC}) : (\text{BDA}) : (\text{ABC}),$$

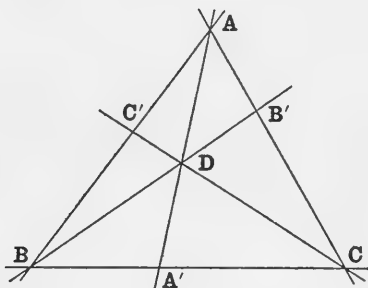
then will

$$\frac{(\text{AC}')}{(\text{C'B})} = \frac{(\text{ADC})}{(\text{CDB})} = \frac{\mu}{\lambda}$$

$$\frac{(\text{BA}')}{(\text{A'C})} = \frac{(\text{BDA})}{(\text{ADC})} = \frac{\nu}{\mu}$$

$$\frac{(\text{CB}')}{(\text{B'A})} = \frac{(\text{CDB})}{(\text{BDA})} = \frac{\lambda}{\nu}$$

$$\frac{(\text{DA})}{(\text{A'D})} = \frac{(\text{ABDC})}{(\text{DBC})} = \frac{\mu + \nu}{\lambda}.$$



Let ϵ' and ϵ be the indices of **A'** and **D**, then will

$$\epsilon' = \frac{\text{A'C}\epsilon_2 + \text{BA}'\epsilon_3}{\text{BC}} = \frac{\mu\epsilon_2 + \nu\epsilon_3}{\mu + \nu}$$

and

$$\begin{aligned} \epsilon &= \frac{\text{A'D}\epsilon_1 + \text{DA}\epsilon'}{\text{A'A}} = \frac{\lambda\epsilon_1 + (\mu + \nu)\epsilon'}{\lambda + \mu + \nu} \\ &= \frac{\lambda\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\lambda + \mu + \nu} \end{aligned}$$

$-\frac{\mu}{\lambda}$, $-\frac{\nu}{\mu}$ and $-\frac{\lambda}{\nu}$ are the Cevan ratios of **ABC**; **D**. viz.

C'A: **C'B**, **A'B**: **A'C** and **B'C**: **B'A**.

Let **E**, **F** and **G** be the feet of perpendiculars let fall from **D** on **BC**, **CA** and **AB** respectively and let $a = ED$, $\beta = FD$ and $\gamma = GD$, then will

$$aa : \beta : c\gamma : 2\Delta :: (\mathbf{CDB}) : (\mathbf{ADC}) : (\mathbf{BDA}) : (\mathbf{ABC}) \\ :: \lambda : \mu : \nu : \lambda + \mu + \nu$$

$$\therefore \epsilon = \frac{aa\epsilon_1 + b\beta\epsilon_2 + c\gamma\epsilon_3}{2\Delta}$$

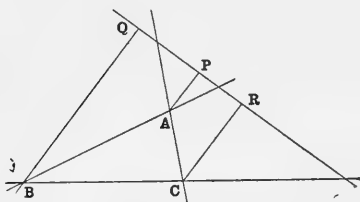
If $x : y : z : 1 :: \lambda : \mu : \nu : \lambda + \mu + \nu$ then will

$$\epsilon = x\epsilon_1 + y\epsilon_2 + z\epsilon_3$$

wherein $x + y + z = 1$.

II. Lemma. Let **ABC** be a triangle, **d** a straight line in the plane of **ABC**, **P**, **Q** and **R** the feet of perpendiculars let fall on **d** from **A**, **B** and **C** respectively, and p , q and r the numerics of (**PA**), (**QB**) and (**RC**), then will

$$a^2(p-q)(p-r) + b^2(q-r)(q-p) + c^2(r-p)(r-q) = 4\Delta^2$$



Let

$$(QR \angle BC) = \theta_1$$

$$(QR \angle CA) = \theta_2 = A + B + \theta_1$$

$$(QR \angle AB) = \theta_3 = B + C + \theta_2$$

$$\therefore \theta_2 - \theta_1 = \pi - C$$

$$\theta_3 - \theta_2 = \pi - A$$

$$\text{and } \theta_3 - \theta_1 = \pi + B$$

$$\text{and } a \sin \theta_1 = QB - RC = q - r$$

$$b \sin \theta_2 = RC - PA = r - p$$

$$c \sin \theta_3 = PA - QB = p - q$$

$$\therefore ap \sin \theta_1 + bq \sin \theta_2 + cr \sin \theta_3 = 0.$$

Also

$$a \cos \theta_1 = QR = QP + PR$$

$$b \cos \theta_2 = RP = RQ + QP$$

$$c \cos \theta_3 = PQ = PR + RQ$$

$$\therefore ap \cos \theta_1 + bq \cos \theta_2 + cr \cos \theta_3 = 2\Delta.$$

$$\therefore a^2p^2 + b^2q^2 + c^2r^2 - 2bcqr \cos A - 2acpr \cos B \\ - 2abpq \cos C = 4\Delta^2$$

On substituting $b^2 + c^2 - a^2$ for $2bc \cos A$, etc., and reducing, this becomes

$$a^2(p-q)(p-r) + b^2(q-r)(q-p) + c^2(r-p)(r-q) = 4\Delta^2$$

Cor. If

$$PA : QB : RC : 2\Delta :: l : m : n : 2\Delta'$$

then will

$$2\Delta' = \sqrt{\{a^2(l-m)(l-n) + b^2(m-l)(m-n) + c^2(r-l)(r-m)\}}.$$

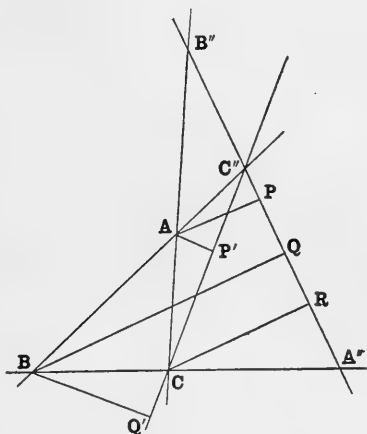
III. Given the indices of the lines **AB**, **BC** and **CA**, to determine the index of any other line **d**, in the plane of **ABC**.

Let **d** intersect **BC** in **A''**, **CA** in **B''** and **AB** in **C''**, let **P**, **Q** and **R** be the feet of perpendiculars let fall on **d** from **A**, **B** and **C** respectively and let $l : m$, $m : n$ and $n : l$ be the Menelaän ratios of (**ABC**; **d**), then will

$$\frac{(C''A)}{(C''B)} = \frac{(PA)}{(QB)} = \frac{l}{m},$$

$$\frac{(A''B)}{(A''C)} = \frac{(QB)}{(RC)} = \frac{m}{n},$$

$$\frac{(B''C)}{(B''A)} = \frac{(RC)}{(PA)} = \frac{n}{l}.$$



Draw **CC''** and let **P'** and **Q'** be the feet of perpendiculars let fall on **CC''** from **A** and **B**, and η_1 , η_2 , η_3 , η' and η be the indices of **BC**, **CA**, **AB**, **CC''** and **A''C''** respectively, then will

$$\begin{aligned} \eta' &= \frac{\sin(CC'' \angle CA) \eta_1 + \sin(BC \angle CC'') \eta_2}{\sin(BC \angle CA)} \\ &= \frac{\sin C''CA \eta_1 + \sin C''CB \eta_2}{\sin C} \\ &= \frac{\frac{P'A}{CA} \eta_1 + \frac{Q'B}{BC} \eta_2}{\sin C}, \end{aligned}$$

and

$$\begin{aligned} \eta &= \frac{\sin(A''C'' \angle AB) \eta' + \sin(CC'' \angle A''C'') \eta_3}{\sin(CC'' \angle AB)} \\ &= \frac{\sin(A''C'' \angle AB) \eta' - \sin A''C''C \eta_3}{\sin(CC'' \angle AB)} \\ &= \frac{\frac{PA}{C''A} \cdot \frac{P'A}{CA} \eta_1 + \frac{QB}{C''B} \cdot \frac{Q'B}{BC} \eta_2 + \frac{RC}{CC''} \sin C \eta_3}{\sin(CC'' \angle AB) \sin C} \end{aligned}$$

$$\text{Also, } \sin(CC'' \angle AB) = \frac{P'A}{C''A} = \frac{Q'B}{C''B} = \frac{CA}{CC''} \sin A = \frac{CA}{CC''} \cdot \frac{BC}{AB} \sin C,$$

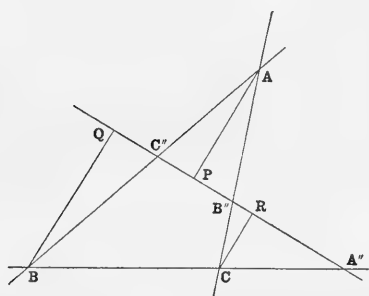
$$\therefore \eta = \frac{\frac{PA}{CA} \eta_1 + \frac{QB}{BC} \eta_2 + \frac{RC}{CA} \cdot \frac{AB}{BC} \eta_3}{\sin C}$$

\therefore by Lemma, Corollary,

$$\eta = \frac{al\eta_1 + bm\eta_2 + cn\eta_3}{\sqrt{\{a^2(l-m)(l-n) + \dots\}}}$$

IV. Given the indices of the points **A**, **B** and **C** to determine the index of any line **d** in the plane of **ABC**.

Let **A''**, **B''** and **C''** be the points of intersection of **d** and **BC**, **CA** and **AB**, and **P**, **Q**, and **R** the feet of perpendiculars on **d** from **A**, **B** and **C** respectively, let $p = PA$, $q = QB$ and $r = RC$ and let $l : m$, $m : n$, $n : l$ be the Menelaän ratios of **ABC** : **d**, then will



$$\frac{(C''A)}{(C''B'')} = \frac{(C''P)}{(C''Q)} = \frac{(PA)}{(QB)} = \frac{l}{m},$$

$$\frac{(A''B)}{(A''C)} = \frac{(A''Q)}{(A''R)} = \frac{(QB)}{(RC)} = \frac{m}{n},$$

$$\frac{(B''C)}{(B''A)} = \frac{(B''R)}{(B''P)} = \frac{(RC)}{(PA)} = \frac{n}{l},$$

$$\begin{aligned} \frac{(A''B'')}{(RC)} &= \frac{(A''R)}{(RC)} + \frac{(RB'')}{(RC)} \\ &= \frac{(A''Q)}{(QB)} + \frac{(PB'')}{(PA)} \end{aligned}$$

$$\therefore \frac{A''B''}{r} = \frac{A''Q}{q} + \frac{PB''}{p}$$

Let ϵ_1 , ϵ_2 , ϵ_3 , ϵ'_1 , ϵ'_2 , ϵ'_3 , η_1 , η_2 , η_3 and η be the indices of **A**, **B**, **C**, **A''**, **B''**, **C''**, **BC**, **CA**, **AB** and **d** respectively then will

$$\epsilon'_1 = \frac{q\epsilon_3 - r\epsilon_2}{q - r}$$

and

$$\epsilon'_2 = \frac{r\epsilon_1 - p\epsilon_2}{r - p}$$

$$\therefore \epsilon'_1 \epsilon'_2 = \frac{r(p\epsilon_2\epsilon_3 + q\epsilon_3\epsilon_1 + r\epsilon_1\epsilon_2)}{(q - r)(r - p)}$$

$$\therefore A''B''\eta = \frac{p\epsilon_2\epsilon_3 + q\epsilon_3\epsilon_1 + r\epsilon_1\epsilon_2}{p + q - r - pqr^{-1}}$$

$$\begin{aligned}\eta &= \frac{p\epsilon_2\epsilon_3 + q\epsilon_3\epsilon_1 + r\epsilon_1\epsilon_2}{(p+q-r)A''B'' - pA''Q - qPB''} \\ &= \frac{p\epsilon_2\epsilon_3 + q\epsilon_3\epsilon_1 + r\epsilon_1\epsilon_2}{pQB'' + qA''P - rA''B''}\end{aligned}$$

and $PAB = PAQ$,

$$\therefore \eta = \frac{p\epsilon_2\epsilon_3 + q\epsilon_3\epsilon_1 + r\epsilon_1\epsilon_2}{2\Delta}$$

$$\begin{aligned}\therefore \eta &= \frac{l\epsilon_2\epsilon_3 + m\epsilon_3\epsilon_1 + n\epsilon_1\epsilon_2}{\sqrt{\{a^2(l-m)(l-n) + \dots\}}} \\ &= \frac{al\eta_1 + bm\eta_2 + cn\eta_3}{\sqrt{\{a^2(l-m)(l-n) + \dots\}}}\end{aligned}$$

V. The condition that a point shall lie on a line is that the product of their indices shall vanish, therefore using the notation of propositions I and III, if **D** lie on **d**

$$\begin{aligned}\epsilon\eta &= \frac{(\lambda\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3)(p\epsilon_2\epsilon_3 + q\epsilon_3\epsilon_1 + r\epsilon_1\epsilon_2)}{2(\lambda + \mu + \nu)\Delta} \\ &= \frac{p\lambda + q\mu + r\nu}{2(\lambda + \mu + \nu)} = 0.\end{aligned}$$

$$\therefore p\lambda + q\mu + r\nu = 0$$

$$\therefore l\lambda + m\mu + n\nu = 0$$

This is the point equation of the line of index η and the line equation of the point of index ϵ , in the former case the ratios $l:m:n$ are constants, in the latter case the ratios $\lambda:\mu:\nu$ are constants.

VI. The point **P** and the line **p** are said to be relatively pole and polar with respect to the triangle **ABC**, if the Menelaän points of **abc**; **p** are the harmonic conjugates with respect to **A**, **B** and **C** of the Cevan points of **ABC**; **P**, i.e., if

$$\text{ind } \mathbf{P} = \frac{\lambda_1\epsilon_1 + \mu_1\epsilon_2 + \nu_1\epsilon_3}{\lambda_1 + \mu_1 + \nu_1}$$

$$\text{then will } \text{ind } \mathbf{p} = \frac{\lambda_1^{-1}\epsilon_2\epsilon_3 + \mu_1^{-1}\epsilon_3\epsilon_1 + \nu_1^{-1}\epsilon_1\epsilon_2}{\sqrt{\{a^2(\lambda_1^{-1} - \mu_1^{-1})(\lambda_1^{-1} - \nu_1^{-1} + \dots)\}}}$$

$$\therefore \frac{\lambda}{\lambda_1} + \frac{\mu}{\mu_1} + \frac{\nu}{\nu_1} = 0$$

will be the point equation of **p**

and
$$\frac{l}{l_1} + \frac{m}{m_1} + \frac{n}{n_1} = 0$$

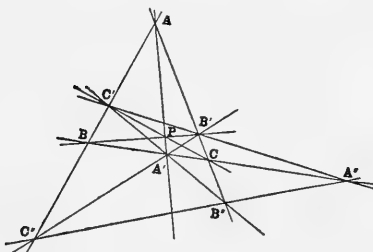
will be the line equation of \mathbf{P} .

VII. Given the triangle \mathbf{ABC} and a coplanar point \mathbf{P}_1 to locate the polar of \mathbf{P} with respect to \mathbf{ABC} .

Construct

$$\begin{aligned} \mathbf{BC} \cdot \mathbf{AP} &= \mathbf{A'}, & \mathbf{CA} \cdot \mathbf{BP} &= \mathbf{B'} & \text{and} & \mathbf{AB} \cdot \mathbf{CP} &= \mathbf{C'}, \\ \mathbf{BC} \cdot \mathbf{B'C'} &= \mathbf{A''}, & \mathbf{CA} \cdot \mathbf{C'A'} &= \mathbf{B''} & \text{and} & \mathbf{AB} \cdot \mathbf{A'B'} &= \mathbf{C''}, \end{aligned}$$

then will $\mathbf{A''}$, $\mathbf{B''}$, $\mathbf{C''}$ be collinear on the polar of \mathbf{P} .



Let $\epsilon_1, \epsilon_2, \epsilon_3, \epsilon'_1, \epsilon'_2, \epsilon'_3, \epsilon''_1, \epsilon''_2$ and ϵ''_3 be the indices of $\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{A'}, \mathbf{B'}, \mathbf{C'}, \mathbf{A''}, \mathbf{B''}$ and $\mathbf{C''}$ respectively, and let

$$\frac{(\mathbf{AC'})}{(\mathbf{C'B})} = \frac{\mu'}{\lambda'}$$

$$\frac{(\mathbf{BA'})}{(\mathbf{A'C})} = \frac{\nu'}{\mu'}$$

$$\frac{(\mathbf{CB'})}{(\mathbf{B'A})} = \frac{\lambda'}{\nu'}$$

$$\frac{(\mathbf{C''A})}{(\mathbf{C''B})} = \frac{l}{m} \quad \frac{(\mathbf{A''B})}{(\mathbf{A''C})} = \frac{m}{n} \quad \frac{(\mathbf{B''C})}{(\mathbf{B''A})} = \frac{n}{l_1};$$

then will $\text{ind } \mathbf{P} = \frac{\lambda' \epsilon_1 + \mu' \epsilon_2 + \nu' \epsilon_3}{\lambda' + \mu' + \nu'}$

and $\epsilon'_1 = \frac{\mu' \epsilon_2 + \nu' \epsilon_3}{\mu' + \nu'}, \quad \epsilon'_2 = \frac{\lambda' \epsilon_1 + \nu' \epsilon_3}{\lambda' + \nu'}$

and $\epsilon''_3 = \frac{m \epsilon_1 - l \epsilon_2}{m - l} = x \epsilon'_1 + (1 - x) \epsilon'_2$

$$\therefore \frac{m}{m-l} = \frac{\lambda'(1-x)}{\lambda' + \nu'}, \quad \frac{-l}{m-l} = \frac{\mu'x}{\mu' + \nu'}, \quad \frac{x}{\mu' + \nu'} + \frac{1-x}{\lambda' + \nu'} = 0,$$

$$\therefore \frac{l}{m} = \frac{\lambda'}{\mu'}$$

Similarly it may be shown that

$$\frac{m}{n} = \frac{\nu'}{\mu'} \quad \text{and} \quad \frac{n}{l_1} = \frac{\lambda'}{\nu'}$$

$$\therefore l_1 = l$$

$\therefore \mathbf{A}'', \mathbf{B}''$ and \mathbf{C}'' are the harmonic conjugates of \mathbf{A}', \mathbf{B}' and \mathbf{C}' and lie on the straight line of index

$$\frac{(\lambda')^{-1}\epsilon_2\epsilon_3 + (\mu')^{-1}\epsilon_3\epsilon_1 + (\nu')^{-1}\epsilon_1\epsilon_2}{2\Delta'}$$

and \therefore of equation

$$\frac{\lambda}{\lambda'} + \frac{\mu}{\mu'} + \frac{\nu}{\nu'} = 0$$

which line is therefore the polar of \mathbf{P} .

The lines $\mathbf{A}'' | \mathbf{B}' | \mathbf{C}'$, $\mathbf{A}' | \mathbf{B}'' | \mathbf{C}'$ and $\mathbf{A}' | \mathbf{B}' | \mathbf{C}''$ are the harmonians of $\mathbf{A}'' | \mathbf{B}'' | \mathbf{C}''$ with respect to the triangle \mathbf{ABC} .

VIII Given the triangle \mathbf{abc} and a coplanar line \mathbf{p} to locate the pole of \mathbf{p} with respect to \mathbf{abc} .

Construct

$$\mathbf{b.c} | \mathbf{a.p} = \mathbf{a}'', \quad \mathbf{c.a} | \mathbf{b.p} = \mathbf{b}'' \text{ and } \mathbf{a.b} | \mathbf{c.p} = \mathbf{c}''$$

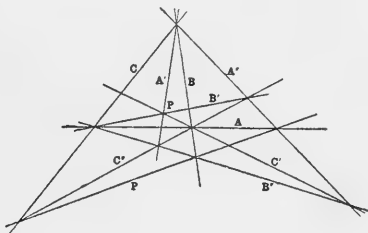
$$\mathbf{b.c} | \mathbf{b''.c''} = \mathbf{a}', \quad \mathbf{c.a} | \mathbf{c''.a''} = \mathbf{b}' \text{ and } \mathbf{a.b} | \mathbf{a''.b''} = \mathbf{c}',$$

then will \mathbf{a}', \mathbf{b}' and \mathbf{c}' be concurrent at the pole of \mathbf{p} .

Let $\epsilon_1, \epsilon_2, \epsilon_3, \epsilon''_1, \epsilon''_2, \epsilon''_3, \epsilon'_1, \epsilon'_2$ and ϵ'_3 be the indices of $\mathbf{b.c}, \mathbf{c.a}, \mathbf{a.b}, \mathbf{a.p}, \mathbf{b.p}, \mathbf{c.p}, \mathbf{a.a'}, \mathbf{b.b'}$ and $\mathbf{c.c'}$ respectively, then will

$$\epsilon''_2 = \frac{l\epsilon_3 - n\epsilon_1}{l - n}$$

$$\epsilon''_3 = \frac{l\epsilon_2 - m\epsilon_1}{l - m}$$



and

$$\text{ind } \mathbf{b''.c''} = (1-x)\epsilon_2 + x\epsilon''_2 = (1-y)\epsilon_3 + y\epsilon''_3$$

$$\therefore \frac{nx}{l-n} = \frac{my}{m-n}, \quad 1-x = \frac{ly}{l-m}, \quad 1-y = \frac{lx}{l-n}$$

$$\text{ind } \mathbf{b''.c''} = \frac{-l^{-1}\epsilon_1 + m^{-1}\epsilon_2 + n^{-1}\epsilon_3}{-l^{-1} + m^{-1} + n^{-1}}$$

$$\therefore \epsilon'_1 = \frac{m^{-1}\epsilon_2 + n^{-1}\epsilon_3}{m^{-1} + n^{-1}}$$

Similarly it may be shown that

$$\epsilon'_2 = \frac{l^{-1}\epsilon_1 + n^{-1}\epsilon_3}{l^{-1} + n^{-1}} \text{ and } \epsilon'_3 = \frac{l^{-1}\epsilon_1 + m^{-1}\epsilon_2}{l^{-1} + m^{-1}},$$

$\therefore \mathbf{a}', \mathbf{b}'$ and \mathbf{c}' are the harmonic conjugates of $\mathbf{a}'', \mathbf{b}''$ and \mathbf{c}'' and concur in the point of index

$$\frac{l^{-1}\epsilon_1 + m^{-1}\epsilon_2 + n^{-1}\epsilon_3}{l^{-1} + m^{-1} + n^{-1}}$$

and \therefore of equation

$$\frac{l'}{l} + \frac{m'}{m} + \frac{n'}{n} = 0$$

which point is the pole of \mathbf{p} ;

The points $\mathbf{a}'\mathbf{b}''\mathbf{c}''$, $\mathbf{a}''\mathbf{b}'\mathbf{c}''$ and $\mathbf{a}''\mathbf{b}''\mathbf{c}'$ are the harmonians of $\mathbf{a}'\mathbf{b}'\mathbf{c}'$ with respect to the triangle \mathbf{abc} .

IX. To determine ρ , the numerical measure of the distance between \mathbf{P} and \mathbf{Q} , two points in the plane of \mathbf{ABC} , whose Cevan ratios to \mathbf{ABC} are given.

Let $\epsilon_1, \epsilon_2, \epsilon_3, \epsilon_4$ and ϵ_5 be the indices of $\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{P}$ and \mathbf{Q} respectively. η the index of \mathbf{PQ}

$\epsilon_4 = x_1\epsilon_1 + y_1\epsilon_2 + z_1\epsilon_3$ in which $x_1 + y_1 + z_1 = 1$
and $\epsilon_5 = x_2\epsilon_1 + y_2\epsilon_2 + z_2\epsilon_3$ in which $x_2 + y_2 + z_2 = 1$
then will

$$\rho\eta = \epsilon_4\epsilon_5 = (y_1z_2 - y_2z_1)\epsilon_2\epsilon_3 + (z_1x_2 - z_2x_1)\epsilon_3\epsilon_1 + (x_1y_2 - x_2y_1)\epsilon_1\epsilon_2$$

Also

$$\eta = \frac{l\epsilon_2\epsilon_3 + m\epsilon_3\epsilon_1 + n\epsilon_1\epsilon_2}{2\Delta'}$$

in which $2\Delta' = \sqrt{\{a^2(l-m)(l-n) + \dots\}}$

$$\therefore \frac{l}{2\Delta'} = \frac{y_1z_2 - y_2z_1}{\rho}, \quad \frac{m}{2\Delta'} = \frac{z_1x_2 - z_2x_1}{\rho}, \quad \frac{n}{2\Delta'} = \frac{x_1y_2 - x_2y_1}{\rho}$$

$$\therefore \frac{l-m}{2\Delta'} = \frac{z_2 - z_1}{\rho}, \quad \frac{m-n}{2\Delta'} = \frac{x_2 - x_1}{\rho}, \quad \frac{n-l}{2\Delta'} = \frac{y_2 - y_1}{\rho}$$

$$\therefore \rho^2 = -\{a^2(y_2 - y_1)(z_2 - z_1) + b^2(z_2 - z_1)(x_2 - x_1) + c^2(x_2 - x_1)(y_2 - y_1)\}$$

On substituting $\frac{\lambda_1}{\lambda_1 + \mu_1 + \nu_1}$ for x_1 , $\frac{\mu_1}{\lambda_1 + \mu_1 + \nu_1}$ for y_1 , etc., ρ^2 is obtained in terms of a, b, c and the Cevan ratios of \mathbf{P} and \mathbf{Q} .

The following resolution gives the value of ρ^2 as the product of two determinants.

Let η_1, η_2, η_3 be the indices of $\mathbf{BC}, \mathbf{CA}, \mathbf{AB}$ and θ be the numeric of $(\mathbf{PQ} \angle \mathbf{AB})$, then will

$$\eta = \eta_1 e^{i\theta} = \eta_2 e^{-i(\pi - C - \theta)} = \eta_3 e^{i(\pi - B + \theta)}$$

$$\therefore (\eta_1 - \eta_2 e^{iC} - \eta_3 e^{-iB}) e^{i\theta} = 3\eta$$

$$\text{And } (\eta_1 - \eta_2 e^{iC} - \eta_3 e^{-iB}) (a\epsilon_1 - b e^{-iC} \epsilon_2 - c e^{iB} \epsilon_3) = 3\Delta$$

$$\therefore \Delta e^{i\theta} = \eta (a\epsilon_1 - b e^{-iC} \epsilon_2 - c e^{iB} \epsilon_3)$$

$$\text{and } \epsilon_4 = x_1 \epsilon_1 + y_1 \epsilon_2 + z_1 \epsilon_3$$

$$\epsilon_5 = x_2 \epsilon_1 + y_2 \epsilon_2 + z_2 \epsilon_3$$

$$\therefore \rho e^{i\theta} = \begin{vmatrix} a & -b e^{-iC} & -c e^{iB} \\ x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \end{vmatrix} = \nabla_1$$

$$\rho e^{-i\theta} = \nabla_2$$

$$\therefore \rho^2 = \nabla_1 \times \nabla_2.$$

X. To determine δ , the numeric of the perpendicular distance of the point of index ϵ from the line of index η .

$$\text{Let } \epsilon = \frac{\lambda \epsilon_1 + \mu \epsilon_2 + \nu \epsilon_3}{\lambda + \mu + \nu}$$

$$\text{and } \eta = \frac{p \epsilon_2 \epsilon_3 + q \epsilon_3 \epsilon_1 + r \epsilon_1 \epsilon_2}{2\Delta}$$

then will

$$\begin{aligned} \delta = 2\epsilon\eta &= \frac{\lambda p + \mu q + \nu r}{\lambda + \mu + \nu} \\ &= \frac{(l\lambda + m\mu + n\nu)\Delta}{(\lambda + \mu + \nu)\Delta'} \end{aligned}$$

XI. To determine θ_1 the numeric of the angle between the lines of indices η_4, η_5 .

Let $\epsilon_1, \epsilon_2, \epsilon_3, \eta_1, \eta_2, \eta_3$ be the indices of the angular points and the sides of the triangle of reference and ϵ be the index of the point of intersection of the lines of indices η_4, η_5 , then will

$$\begin{aligned} \eta_3 \eta_2 &= \frac{1}{2} \sin A \cdot \epsilon_1 & \eta_1 \eta_3 &= \frac{1}{2} \sin B \cdot \epsilon_2 \\ \eta_2 \eta_1 &= \frac{1}{2} \sin C \cdot \epsilon_3 & \eta_5 \eta_4 &= \frac{1}{2} \sin \theta \cdot \epsilon \end{aligned}$$

$$\text{Let } \eta_4 = \frac{ap_1 \eta_1 + bq_1 \eta_2 + cr_1 \eta_3}{2\Delta}$$

$$\text{and } \eta_5 = \frac{ap_2 \eta_1 + bq_2 \eta_2 + cr_2 \eta_3}{2\Delta}$$

$$\therefore \eta_5 \eta_4 = \frac{bc(q_1 r_2 - q_2 r_1) \eta_3 \eta_2 + ca(p_2 r_1 - p_1 r_2) \eta_1 \eta_3 + ab(p_1 q_2 - p_2 q_1) \eta_2 \eta_1}{4\Delta^2}$$

$$\therefore \sin \theta \cdot \epsilon =$$

$$\frac{bc(q_1r_2 - q_2r_1)\sin A \cdot \epsilon_1 + ca(r_1p_2 - r_2p_1)\sin B \cdot \epsilon_2 + ab(p_1q_2 - p_2q_1)\sin C \cdot \epsilon_3}{4\Delta^2}$$

$$= \frac{(q_1r_2 - q_2r_1)\epsilon_1 + (r_1p_2 - r_2p_1)\epsilon_2 + (p_1q_2 - p_2q_1)\epsilon_3}{2\Delta}$$

$$\text{and } \epsilon = x\epsilon_1 + y\epsilon_2 + z\epsilon_3 \text{ in which } x + y + z = 1$$

$$\therefore 2\Delta x \sin \theta = q_1r_2 - q_2r_1$$

$$2\Delta y \sin \theta = r_1p_2 - r_2p_1$$

$$2\Delta z \sin \theta = p_1q_2 - p_2q_1$$

$$\therefore \sin \theta = \frac{1}{2\Delta} \begin{vmatrix} 1 & 1 & 1 \\ p_1 & q_1 & r_1 \\ p_2 & q_2 & r_2 \end{vmatrix} = \frac{\Delta}{2\Delta_1'\Delta_2'} \begin{vmatrix} 1 & 1 & 1 \\ l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \end{vmatrix}$$

XII. Given the triangle **ABC**, **A'** a point on **BC**, **B'** a point **CA**, **C'** a point on **AB**, **G** = **CC'** . **AA'**, **E** = **AA'** . **BB'** and **F** = **BB'** . **CC'**, to determine the ratios (**A'B'C'**) : (**ABC**) and (**EFG**) : (**ABC**).

Let

$$(\mathbf{AC'}) : (\mathbf{C'B}) :: \mu : \lambda$$

$$(\mathbf{BA'}) : (\mathbf{A'C}) :: \nu_1 : \mu$$

$$(\mathbf{CB'}) : (\mathbf{B'A}) :: \lambda : \nu_2$$

$$\therefore \nu_1 : \nu_2 :: AC' \cdot BA' \cdot CB' : C'B \cdot A'C \cdot B'A$$

$$\text{and } \lambda : \lambda + \mu + \nu_1 :: C'B \cdot A'C : ac - C'B \cdot BA'$$

$$\lambda : \lambda + \mu + \nu_2 :: C'B \cdot CB' : bc - B'A \cdot AC'$$

$$\text{and } \lambda\mu : \lambda\nu_1 + \mu\nu_2 + \nu_1\nu_2 :: A'C \cdot CB' : ab - A'C \cdot CB'$$

$$\frac{A'B'C'}{A B C} = \frac{(\mu\epsilon_2 + \nu_1\epsilon_3) (\lambda\epsilon_1 + \nu_2\epsilon_3) (\lambda\epsilon_1 + \mu\epsilon_2)}{(\mu + \nu_1) (\lambda + \nu) (\lambda + \mu)\Delta}$$

$$= \frac{(\lambda\mu(\nu_1 + \nu_2) \epsilon_1\epsilon_2\epsilon_3)}{(\mu + \nu_1) (\lambda + \nu_2) (\lambda + \mu)\Delta}$$

$$= \frac{AC' \cdot BA' \cdot CB' + C'B \cdot A'C \cdot B'A}{abc}$$

$$\frac{EFG}{ABC} = \frac{(\lambda\epsilon_1 + \mu\epsilon_2 + \nu_2\epsilon_3) (\lambda\epsilon_1 + \mu\epsilon_2 + \nu_1\epsilon_3) (\lambda\nu_1\epsilon_1 + \mu\nu_2\epsilon_2 + \nu_1\nu_2\epsilon_3)}{(\lambda + \mu + \nu_2) (\lambda + \mu + \nu_1) (\lambda\nu_1 + \mu\nu_2 + \nu_1\nu_2)\Delta}$$

$$= \frac{\lambda\mu(\nu_1 - \nu_2)^2\epsilon_1\epsilon_2\epsilon_3}{(\lambda + \mu + \nu_2) (\lambda + \mu + \nu_1) (\lambda\nu_1 + \mu\nu_2 + \nu_1\nu_2)\Delta}$$

$$= \frac{(AC' \cdot BA' \cdot CB' - C'B \cdot A'C \cdot B'A)^2}{(ab - A'C \cdot CB') (bc - B'A \cdot AC') (ca - C'B \cdot BA')}$$

These ratios were given without demonstrations, in Routh's Analytical Statics, Vol. I, p. 89, edition of 1891.

XIII. Given the coplanar triangles **ABC** and **EFG** and the points **A'**=**BC.AE**, **B'**=**CA.BF** and **C'**=**AB.CG**, to determine the ratio (**EFG**) : (**ABC**).

Let

$$(\mathbf{AC}') : (\mathbf{C'B}) :: \mu : \lambda$$

$$(\mathbf{BA}') : (\mathbf{A'C}) :: \nu_1 : \mu$$

$$(\mathbf{CB}') : (\mathbf{B'A}) :: \lambda : \nu_2$$

$$(\mathbf{AE}) : (\mathbf{EA'}) :: \mu + \nu_1 : \rho$$

$$(\mathbf{BF}) : (\mathbf{FB'}) :: \lambda + \nu_2 : \sigma$$

$$(\mathbf{CG}) : (\mathbf{GC'}) :: \lambda + \mu : \tau$$

then will

$$\text{ind } \mathbf{E} = \frac{\rho\epsilon_1 + \mu\epsilon_2 + \nu_1\epsilon_3}{\rho + \mu + \nu_1}$$

$$\text{ind } \mathbf{F} = \frac{\lambda\epsilon_1 + \sigma\epsilon_2 + \nu_2\epsilon_3}{\lambda + \sigma + \nu_2}$$

$$\text{ind } \mathbf{G} = \frac{\lambda\epsilon_1 + \sigma\epsilon_2 + \tau\epsilon_3}{\lambda + \mu + \tau}$$

$$\therefore (\mathbf{EFG}) : (\mathbf{ABC}) = \frac{\begin{vmatrix} \rho & \mu & \nu_1 \\ \lambda & \sigma & \nu_2 \\ \lambda & \mu & \tau \end{vmatrix}}{(\rho + \mu + \nu_1) (\lambda + \sigma + \nu_2) (\lambda + \mu + \tau)}$$

$$= \frac{\begin{vmatrix} BC \cdot EA' & A'C \cdot AE & BA' \cdot AE \\ CB' \cdot BF & CA \cdot FB' & B'A \cdot BF \\ C'B \cdot CG & AC' \cdot CG & AB \cdot GC' \end{vmatrix}}{AB \cdot BC \cdot CA \cdot AA' \cdot BB' \cdot CC'}$$

This theorem includes both (i) and (ii) of Prop. XII;

if $EA' = FB' = GC' = 0$, it reduces to (i);

if $\frac{AE}{EA'} = \frac{BC}{CB'} \cdot \frac{B'A}{BA'}$, $\frac{BF}{FB'} = \frac{CA}{CB'} \cdot \frac{C'B}{AC'}$ and $\frac{CG}{GC'} = \frac{AB}{AC'} \cdot \frac{A'C}{BA'}$

it reduces to (ii).

XIV. Given the coplanar triangles **ABC** and **EFG** and the points **A''=BC.FG**, **B''=CA.GE** and **C''=AB.EF**, to determine the ratio (**A''B''C''**) : (**EFG**).

Join **A** and **E**, **B** and **F**, **C** and **G** and let **A'=AE.BC**, **B'=BF.CA** and **C'=CG.AB**, then employing the notation of XIII,

$$\text{ind } \mathbf{E} = \frac{\rho\epsilon_1 + \mu\epsilon_2 + \nu_1\epsilon_3}{\rho + \mu + \nu_1}$$

$$\text{ind } \mathbf{F} = \frac{\lambda\epsilon_1 + \sigma\epsilon_2 + \nu_2\epsilon_3}{\lambda + \sigma + \nu_2}$$

and
$$\text{ind } \mathbf{G} = \frac{\lambda\epsilon_1 + \mu\epsilon_2 + \tau\epsilon_3}{\lambda + \mu + \tau}$$

If ind **C''** = $x\epsilon_1 + (1-x)\epsilon_2$, then will

$$\{x\epsilon_1 + (1-x)\epsilon_2\} (\rho\epsilon_1 + \mu\epsilon_2 + \nu_1\epsilon_3) (\lambda\epsilon_1 + \sigma\epsilon_2 + \nu_2\epsilon_3) = 0$$

$$\therefore \begin{vmatrix} x & 1-x & 0 \\ \rho & \mu & \nu_1 \\ \lambda & \sigma & \nu_2 \end{vmatrix} = 0,$$

$$\therefore x = \frac{\lambda\nu_1 - \rho\nu_2}{(\lambda + \sigma)\nu_1 - (\mu + \rho)\nu_2}$$

and
$$\text{ind } \mathbf{C''} = \frac{(\lambda\nu_1 - \rho\nu_2)\epsilon_1 - (\mu\nu_2 - \sigma\nu_1)\epsilon_2}{(\lambda + \sigma)\nu_1 - (\mu + \rho)\nu_2}$$

In like manner it may be shown that

$$\text{ind } \mathbf{A''} = \frac{(\mu - \sigma)\epsilon_2 - (\nu_2 - \tau)\epsilon_3}{\mu - \sigma - \nu_2 + \tau}$$

and
$$\text{ind } \mathbf{B''} = \frac{(\nu_1 - \tau)\epsilon_3 - (\lambda - \rho)\epsilon_1}{\nu_1 - \tau - \lambda + \rho}$$

$$\therefore A''B''C'' = \begin{vmatrix} 0 & \mu - \sigma & -\nu_2 + \tau \\ -\lambda + \rho & 0 & \nu_1 - \tau \\ \lambda\nu_1 - \rho\nu_2 & -\mu\nu_2 + \sigma\nu_1 & 0 \end{vmatrix} \frac{ABC}{\delta_1\delta_2\delta_3}$$

$$= (\nu_2 - \nu_1) \begin{vmatrix} \rho & \mu & \nu_1 \\ \lambda & \sigma & \nu_2 \\ \lambda & \mu & \tau \end{vmatrix} \frac{ABC}{\delta_1\delta_2\delta_3}$$

$$\therefore \delta_1\delta_2\delta_3 A''B''C'' = (\nu_2 - \nu_1) (\rho + \mu + \nu_1) (\lambda + \sigma + \nu_2) (\lambda + \mu + \tau) EFG$$

in which

$$\delta_1 = \mu - \sigma - \nu_2 + \tau$$

$$\delta_2 = \nu_1 - \tau - \lambda + \rho$$

and

$$\delta_3 = (\lambda + \sigma)\nu_1 - (\mu + \rho)\nu_2$$

On substituting for the ratios $\mu : \lambda$, etc., their equivalents in line-segment ratios, we obtain

$$\begin{aligned} A''B''C'' : EFG &= AB \cdot BC \cdot CA \cdot AA' \cdot BB' \cdot CC' \cdot AE \cdot BF \cdot CG \\ &\quad (AC' \cdot BA' \cdot CB' - C'B \cdot A'C \cdot B'A) : \\ \{ &(AB \cdot A'C \cdot CC' \cdot AE - BC \cdot AC' \cdot AA' \cdot CG) \\ &\quad (BC \cdot B'A \cdot AA' \cdot BF - CA \cdot BA' \cdot BB' \cdot AE) \\ &\quad (CA \cdot C'B \cdot BB' \cdot CG - AB \cdot CB' \cdot CC' \cdot BF) \}. \end{aligned}$$

Corollary. If $AC' \cdot BA' \cdot CB' - C'B \cdot A'C \cdot B'A = 0$ then will $A''B''C'' = 0$, i.e., if **AE**, **BF** and **CG** are concurrent, **A''**, **B''** and **C''** are collinear.

Conversely, if $A''B''C'' = 0$ and neither $ABC = 0$ nor $EFG = 0$, then must $AC' \cdot BA' \cdot CB' - C'B \cdot A'C \cdot B'A = 0$, i.e., if **A''**, **B''** and **C''** are collinear, then will **AE**, **BF** and **CG** be concurrent.

DEFINITIONS.—If the triangles **ABC**, **EFG** are in plane perspective, and on the connectors **AE**, **BF**, **CG** third points **O**, **P**, **Q** be taken the triangles **ABC**, **EFG**, **OPQ** will be in concentric perspective.

If the triangles **abc**, **efg** are in plane perspective and through the axial points **A''**, **B''**, **C''** third lines **o**, **p**, **q** be drawn, the triangles **abc**, **efg**, **opq** will be in coaxial perspective.

XV. If three triangles are in concentric perspective their axes of perspective are concurrent.

Let **ABC**, **EFG** and **OPQ** be in concentric perspective, **D** their centre of perspective, $A'' = BC \cdot FG$, $B'' = CA \cdot GE$, $C'' = AB \cdot EF$, $E'' = FG \cdot PQ$, $F'' = GE \cdot QO$, $G'' = EF \cdot OP$, $O'' = PQ \cdot BC$, $P'' = QO \cdot CA$, $Q'' = OP \cdot AB$ and $R = A''B'' \cdot O''P''$, also let

$$\begin{aligned} \text{ind } D &= \frac{\lambda\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\lambda + \mu + \nu} \\ \text{ind } E &= \frac{(\lambda - l)\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\lambda - l + \mu + \nu} \\ \text{ind } F &= \frac{\lambda\epsilon_1 + (\mu - m)\epsilon_2 + \nu\epsilon_3}{\lambda + \mu - m + \nu} \\ \text{ind } G &= \frac{\lambda\epsilon_1 + \mu\epsilon_2 + (\nu - n)\epsilon_3}{\lambda + \mu + \nu - n} \\ \text{ind } O &= \frac{(\lambda - \phi)\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\lambda - \phi + \mu + \nu} \end{aligned}$$

$$\text{ind } \mathbf{P} = \frac{\lambda\epsilon_1 + (\mu - \chi)\epsilon_2 + \nu\epsilon_3}{\lambda + \mu - \chi + \nu}$$

$$\text{ind } \mathbf{Q} = \frac{\lambda\epsilon_1 + \mu\epsilon_2 + (\nu - \Psi)\epsilon_3}{\lambda + \mu + \nu - \Psi}$$

As \mathbf{A}'' lies on \mathbf{BC} and also on \mathbf{FG} ,

$$\text{if } \text{ind } \mathbf{A}'' = x\epsilon_2 + (1-x)\epsilon_3$$

then will $\{x\epsilon_2 + (1-x)\epsilon_3\} \{\lambda\epsilon_1 + (\mu - m)\epsilon_2 + \nu\epsilon_3\} \{\lambda\epsilon_1 + \mu\epsilon_2 + (\nu - n)\epsilon_3\} = 0$

$$\therefore \begin{vmatrix} 0 & x & 1-x \\ \lambda & \mu-m & \nu \\ \lambda & \mu & \nu-n \end{vmatrix} = 0$$

$$\therefore x = \frac{m}{m-n}$$

$$\therefore \text{ind } \mathbf{A}'' = \frac{m\epsilon_2 - n\epsilon_3}{m-n}$$

Similarly it may be shown that

$$\text{ind } \mathbf{B}'' = \frac{n\epsilon_3 - l\epsilon_1}{n-l}, \quad \text{ind } \mathbf{C}'' = \frac{l\epsilon_1 - m\epsilon_2}{l-m},$$

$$\text{ind } \mathbf{O}'' = \frac{\chi\epsilon^2 - \Psi\epsilon_3}{\chi - \Psi}, \quad \text{ind } \mathbf{P}'' = \frac{\Psi\epsilon_3 - \phi\epsilon_1}{\Psi - \phi}, \quad \text{ind } \mathbf{Q}'' = \frac{\phi\epsilon_1 - \chi\epsilon_2}{\phi - \chi}$$

$$\text{ind } \mathbf{E}'' =$$

$$\frac{\lambda(m\psi - n\chi)\epsilon_1 + \{\mu(m\psi - n\chi) + m\chi(n - \psi)\}\epsilon_2 + \{\nu(m\psi - n\chi) - n\psi(m - \chi)\}\epsilon_3}{(\lambda + \mu + \nu - m)(m\psi - n\chi) + (m - n)(m - \chi)\psi}$$

$$\text{ind } \mathbf{F}'' =$$

$$\frac{\{\lambda(n\phi - l\psi) - l\phi(n - \psi)\}\epsilon_1 + \mu(n\phi - l\psi)\epsilon_2 + \{\nu(n\phi - l\chi) + n\psi(l - \phi)\}\epsilon_3}{(\lambda + \mu + \nu - n)(n\phi - l\psi) + (n - l)(n - \psi)\phi}$$

$$\text{ind } \mathbf{G}'' =$$

$$\frac{\{\lambda(l\chi - m\phi) + l\phi(m - \chi)\}\epsilon_1 + \{\mu(l\chi - m\phi) - m\chi(l - \phi)\}\epsilon_2 + \nu(l\chi - m\phi)\epsilon_3}{(\lambda + \mu + \nu - l)(l\chi - m\phi) + (l - m)(l - \phi)\chi}$$

Also $\mathbf{A}''\mathbf{B}''$ and $\mathbf{O}''\mathbf{P}''$ intersect at \mathbf{R}

$$\therefore \text{if } \text{ind } \mathbf{R} = x\text{ind } \mathbf{A}'' + (1-x)\text{ind } \mathbf{B}'',$$

$$\left\{ \frac{x(m\epsilon_2 - n\epsilon_3)}{m-n} + \frac{(1-x)(n\epsilon_3 - l\epsilon_1)}{n-l} \right\} (\chi\epsilon_2 - \psi\epsilon_3) (\psi\epsilon_3 - \phi\epsilon_1) = 0$$

On eliminating x , we obtain

$$\text{ind } \mathbf{R} = \frac{l\phi(m\psi - n\chi)\epsilon_1 + m\chi(n\phi - l\psi)\epsilon_2 + n\psi(l\chi - m\phi)\epsilon_3}{(l-n)(m\psi - n\chi)\phi - (m-n)(l\psi - n\phi)\chi}$$

$$\therefore \text{ind } \mathbf{R} \text{ ind } \mathbf{E}'' \text{ ind } \mathbf{F}'' =$$

$$\begin{vmatrix} l\phi L_1 & m\chi M_1 & n\psi N_1 \\ \lambda L_1 & \mu L_1 + m\chi(n - \Psi) & \nu L_1 - n\psi(m - \chi) \\ \lambda M_1 - l\phi(n - \Psi) & \mu M_1 & \nu M_1 + n\psi(l - \phi) \end{vmatrix} \frac{\Delta}{\delta_1 \delta_2 \delta_3}$$

in which

$$L_1 = m\psi - n\chi, \quad M_1 = n\phi - l\psi, \quad N_1 = l\chi - m\phi,$$

$$\delta_1 = l\phi L_1 + m\chi M_1 + n\psi N_1$$

$$\delta_2 = (\lambda + \mu + \nu - m)L_1 + (m - n)(m - \chi)\psi$$

$$\delta_3 = (\lambda + \mu + \nu - n)M_1 + (n - l)(n - \psi)\phi.$$

On evaluating the determinant it will be found to vanish, hence $\text{ind } \mathbf{R} \text{ ind } \mathbf{E}'' \text{ ind } \mathbf{F}'' = 0$, and therefore the line $\mathbf{E}''\mathbf{F}''$ passes through the point \mathbf{R} , i.e., the axial lines $\mathbf{A}''\mathbf{B}''$, $\mathbf{E}''\mathbf{F}''$ and $\mathbf{O}''\mathbf{P}''$ are concurrent.

COROLLARY.—Hence, if three triangles are in concentric perspective, their axial points are the angular points of three other triangles also in concentric perspective, and the axes of perspective of either triad are the central connectors of the other triad.

XVI. If three triangles are in coaxial perspective, their centres of perspective are collinear.

Let \mathbf{ABC} , \mathbf{EFG} , \mathbf{OPQ} be in coaxial perspective and let \mathbf{D}_1 be the centre of perspective of \mathbf{ABC} and \mathbf{EFG} , \mathbf{D}_2 the centre of \mathbf{ABC} and \mathbf{OPQ} , \mathbf{D}_3 the centre of \mathbf{EFG} and \mathbf{OPQ} , $\mathbf{A}'' = \mathbf{BC} \cdot \mathbf{FG} \cdot \mathbf{PQ}$, $\mathbf{B}'' = \mathbf{CA} \cdot \mathbf{GE} \cdot \mathbf{QO}$ and $\mathbf{C}'' = \mathbf{AB} \cdot \mathbf{EF} \cdot \mathbf{OP}$, also let

$$\text{ind } \mathbf{D}_1 = \frac{\lambda\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\lambda + \mu + \nu}$$

$$\text{ind } \mathbf{E} = \frac{(\lambda - l)\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\lambda + \mu + \nu - l}$$

$$\text{ind } \mathbf{F} = \frac{\lambda\epsilon_1 + (\mu - m)\epsilon_2 + \nu\epsilon_3}{\lambda + \mu + \nu - m}$$

$$\text{ind } \mathbf{G} = \frac{\lambda\epsilon_1 + \mu\epsilon_2 + (\nu - n)\epsilon_3}{\lambda + \mu + \nu - n}$$

then will

$$\text{ind } \mathbf{A}'' = \frac{m\epsilon_2 - n\epsilon_3}{m - n} = \text{ind } \mathbf{O}''$$

$$\text{ind } \mathbf{B}'' = \frac{n\epsilon_3 - l\epsilon_1}{n - l} = \text{ind } \mathbf{P}''$$

$$\text{ind } \mathbf{C}'' = \frac{l\epsilon_1 - m\epsilon_2}{l - m} = \text{ind } \mathbf{Q}''$$

Hence if

$$\text{ind } \mathbf{D}_2 = \frac{\lambda_1\epsilon_1 + \mu_1\epsilon_2 + \nu_1\epsilon_3}{\lambda_1 + \mu_1 + \nu_1}$$

then will

$$\text{ind } \mathbf{O} = \frac{(\lambda_1 - l)\epsilon_1 + \mu_1\epsilon_2 + \nu_1\epsilon_3}{\lambda_1 + \mu_1 + \nu_1 - l}$$

$$\text{ind } \mathbf{P} = \frac{\lambda_1\epsilon_1 + (\mu_1 - m)\epsilon_2 + \nu_1\epsilon_3}{\lambda_1 + \mu_1 + \nu_1 - m}$$

$$\text{ind } \mathbf{Q} = \frac{\lambda_1\epsilon_1 + \mu_1\epsilon_2 + (\nu_1 - n)\epsilon_3}{\lambda_1 + \mu_1 + \nu_1 - n}$$

And \therefore

$$\mathbf{D}_3 = \mathbf{EO} \cdot \mathbf{FP}$$

\therefore $\text{ind } \mathbf{D}_3 \text{ ind } \mathbf{F} \text{ ind } \mathbf{P} = 0$

$$\begin{aligned} & \left[\frac{x\{(\lambda - l)\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3\}}{\lambda + \mu + \nu - l} + \frac{(1-x)\{(\lambda_1 - l)\epsilon_1 + \mu_1\epsilon_2 + \nu_1\epsilon_3\}}{\lambda_1 + \mu_1 + \nu_1 - l} \right] \times \\ & \{ \lambda\epsilon_1 + (\mu - m)\epsilon_2 + \nu\epsilon_3 \} \{ \lambda_1\epsilon_1 + (\mu_1 - m)\epsilon_2 + \nu_1\epsilon_3 \} = 0 \\ & \therefore \left| \begin{array}{ccc} \frac{x(\lambda - l)}{\sigma - l} + \frac{(1-x)(\lambda_1 - l)}{\sigma_1 - l} & \frac{x\mu}{\sigma - l} + \frac{(1-x)\mu_1}{\sigma_1 - l} & \frac{x\nu}{\sigma - l} + \frac{(1-x)\nu_1}{\sigma_1 - l} \\ \lambda & \mu - m & \nu \\ \lambda_1 & \mu_1 - m & \nu_1 \end{array} \right| = 0 \end{aligned}$$

in which $\sigma = \lambda + \mu + \nu$ and $\sigma_1 = \lambda_1 + \mu_1 + \nu_1$

Solving for x gives

$$x = \frac{\sigma - l}{\sigma - \sigma_1}$$

$$\begin{aligned} \therefore \text{ind } \mathbf{D}_3 &= \frac{(\lambda - \lambda_1)\epsilon_1 + (\mu - \mu_1)\epsilon_2 + (\nu - \nu_1)\epsilon_3}{\lambda + \mu + \nu - \lambda_1 - \mu_1 - \nu_1} \\ &= \frac{(\lambda + \mu + \nu) \text{ ind } \mathbf{D}_1 - (\lambda_1 + \mu_1 + \nu_1) \text{ ind } \mathbf{D}_2}{\lambda + \mu + \nu - \lambda_1 - \mu_1 - \nu_1} \end{aligned}$$

$\therefore \mathbf{D}_1, \mathbf{D}_2$ and \mathbf{D}_3 are collinear.

XVII. If the triangles **abc**, **efg** are in plane perspective, **ae**, **bf** and **cq** being their axial points, the lines **af** | **be**, **bg** | **cf** and **ce** | **ag** form a triangle in concentric perspective with **abc** and **efg**.

Let **D** be the centre of perspective of **abc** and **efg**, also let **H**=**af**, **I**=**bg**, **K**=**ce**, **L**=**ag**, **M**=**be**, **N**=**cf**, **q**=**HM**, **o**=**IN**, **p**=**KL** and

$$\text{ind } \mathbf{D} = \frac{\lambda\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\phi + \mu + \nu}$$

$$\text{ind } \mathbf{E} = \frac{\phi\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3}{\phi + \mu + \nu}$$

$$\text{ind } \mathbf{F} = \frac{\lambda\epsilon_1 + \chi\epsilon_2 + \nu\epsilon_3}{\lambda + \chi + \nu}$$

$$\text{ind } \mathbf{G} = \frac{\lambda\epsilon_1 + \mu\epsilon_2 + \psi\epsilon_3}{\lambda + \mu + \psi}$$

If $\text{ind } \mathbf{H} = x\epsilon_2 + (1-x)\epsilon_3$

then will $\{x\epsilon_2 + (1-x)\epsilon_3\}(\phi\epsilon_1 + \mu\epsilon_2 + \nu\epsilon_3) (\lambda\epsilon_1 + \mu\epsilon_2 + \psi\epsilon_3) = 0$

Eliminating x_1

$$\text{ind } \mathbf{H} = \frac{(\lambda - \phi)\mu\epsilon_2 + (\lambda\nu - \phi\psi)\epsilon_3}{(\lambda - \phi)\mu + \lambda\nu - \phi\psi}$$

The substitution $(\epsilon_2\epsilon_3)(\mu\nu)(\chi\psi)$ does not affect **ind a** but transforms **ind f** into **ind g**, therefore it transforms **ind H** into **ind L**

$$\therefore \text{ind } \mathbf{L} = \frac{(\lambda\mu - \phi\chi)\epsilon_2 + (\lambda - \phi)\nu\epsilon_3}{(\lambda - \phi)\nu + \lambda\mu - \phi\chi}$$

The substitution $(\epsilon_1\epsilon_3)(\lambda\mu\nu)(\phi\chi\psi)$ transforms **ind H** and **ind L** into **ind I** and **ind M**, and repeated, into **ind K** and **ind N**

$$\therefore \text{ind } \mathbf{I} = \frac{(\mu - \chi)\nu\epsilon_3 + (\lambda\mu - \phi\chi)\epsilon_1}{(\mu - \chi)\nu + \lambda\mu - \phi\chi}$$

$$\text{ind } \mathbf{M} = \frac{(\mu\nu - \chi\psi)\epsilon_3 + (\mu - \chi)\lambda\epsilon_1}{(\mu - \chi)\lambda + \mu\nu - \chi\psi}$$

$$\text{ind } \mathbf{K} = \frac{(\nu - \psi)\lambda\epsilon_1 + (\mu\nu - \chi\psi)\epsilon_2}{(\nu - \psi)\lambda + \mu\nu - \chi\psi}$$

$$\text{ind } \mathbf{N} = \frac{(\lambda\nu - \phi\psi)\epsilon_1 + (\nu - \psi)\mu\epsilon_2}{(\nu - \psi)\mu + \lambda\nu - \phi\psi}$$

Let **O**=**AD** . **HM**, then will

$$\text{ind } \mathbf{O} = (1-x)\epsilon_1 + \frac{x(\mu\epsilon_2 + \nu\epsilon_3)}{\mu + \nu}$$

and

$$\left\{ (1-x) \epsilon_1 + \frac{x(\mu\epsilon_2 + \nu\epsilon_3)}{\mu + \nu} \right\} \{ (\lambda - \phi)\mu\epsilon_2 + (\lambda\nu - \phi\psi)\epsilon_3 \} \{ (\mu - \chi)\epsilon_1 + (\mu\nu - \chi\psi)\epsilon_3 \} \\ = 0$$

Eliminating x ,

$$\text{ind } \mathbf{O} = \frac{-\lambda\phi(\mu - \chi)(\nu - \psi)\epsilon_1 + (\lambda - \phi)(\mu\nu - \chi\psi)(\mu\epsilon_2 + \nu\epsilon_3)}{(\lambda - \phi)(\mu + \nu)(\mu\nu - \chi\psi) - \lambda\phi(\mu - \chi)(\nu - \psi)}$$

The substitution $(\epsilon_2\epsilon_3)(\mu\nu)(\chi\psi)$ which transforms $\text{ind } \mathbf{H}$ into $\text{ind } \mathbf{L}$ and $\text{ind } \mathbf{M}$ into $\text{ind } \mathbf{K}$ does not affect $\text{ind } \mathbf{A}$, $\text{ind } \mathbf{D}$ or $\text{ind } \mathbf{O}$,
 $\therefore \text{ind } \mathbf{O} = \text{ind}\{\mathbf{AD} \cdot \mathbf{HM}\} = \text{ind}\{\mathbf{AD} \cdot \mathbf{LK}\},$
 $\therefore \mathbf{AD}, \mathbf{HM}$ and \mathbf{KL} are concurrent at \mathbf{O} .

Similarly it may be proved that \mathbf{BD}, \mathbf{HM} and \mathbf{IN} are concurrent at say \mathbf{P} and that \mathbf{CD}, \mathbf{IN} and \mathbf{KL} are concurrent at say \mathbf{Q} ; hence \mathbf{OPQ} is in plane perspective with \mathbf{ABC} with \mathbf{D} as the centre of perspective; therefore $\mathbf{ABC} = \mathbf{abc}$, $\mathbf{EFG} = \mathbf{efg}$ and $\mathbf{OPQ} = \mathbf{opq}$ are in concentric perspective.

XVIII. If the triangles $\mathbf{ABC}, \mathbf{EFG}$ are in plane perspective and $\mathbf{AE}, \mathbf{BF}, \mathbf{CG}$ are their central connectors, the points $\mathbf{AF} \cdot \mathbf{EB}, \mathbf{BG} \cdot \mathbf{FC}, \mathbf{CE} \cdot \mathbf{GA}$ are the angular points of a triangle coaxial with the triangles $\mathbf{ABC}, \mathbf{EFG}$.

The proof follows the lines of the proof of Prop. XVII of which this proposition is the dual.

XIX. If the triangles $\mathbf{ABC}, \mathbf{EFG}$ are in plane perspective and $\mathbf{B}' = \mathbf{AC} \cdot \mathbf{BF}$, $\mathbf{C}' = \mathbf{AB} \cdot \mathbf{CG}$, $\mathbf{I} = \mathbf{AC} \cdot \mathbf{EF}$ and $\mathbf{N} = \mathbf{AB} \cdot \mathbf{EG}$, then will $\mathbf{FG}, \mathbf{B'C'}$ and \mathbf{IN} be concurrent.

$$\begin{aligned} \text{If} \quad \text{ind } \mathbf{B}' &= \frac{\lambda\epsilon_1 + \nu\epsilon_3}{\lambda + \nu} \\ \text{ind } \mathbf{C}' &= \frac{\lambda\epsilon_1 + \mu\epsilon_2}{\lambda + \mu} \\ \text{ind } \mathbf{F} &= \frac{\lambda\epsilon_1 + \chi\epsilon_2 + \nu\epsilon_3}{\lambda + \chi + \nu} \\ \text{ind } \mathbf{G} &= \frac{\lambda\epsilon_1 + \mu\epsilon_2 + \psi\epsilon_3}{\lambda + \mu + \psi} \\ \text{ind } \mathbf{I} &= \frac{(\mu - \chi)\nu\epsilon_3 + (\lambda\mu - \phi\chi)\epsilon_1}{(\mu - \chi)\nu + \lambda\mu - \phi\chi} \end{aligned}$$

$$\text{ind } \mathbf{N} = \frac{(\lambda\nu - \phi\psi)\epsilon_1 + (\nu - \psi)\mu\epsilon_2}{\lambda\nu - \phi\psi + (\nu - \psi)\mu}$$

then will

$$\text{ind } \mathbf{B'C'} = \frac{-a\mu\nu\eta_1 + b\lambda\nu\eta_2 + c\lambda\mu\eta_3}{2\Delta_1}$$

$$\text{ind } \mathbf{FG} = \frac{a(\mu\nu - \chi\psi)\eta_1 + b\lambda(\nu - \psi)\eta_2 - c\lambda(\mu - \chi)\eta_3}{2\Delta_2}$$

ind $\mathbf{IN} =$

$$\frac{-a\mu\nu(\mu - \chi)(\nu - \psi)\eta_1 + b\nu(\mu - \chi)(\lambda\nu - \phi\psi)\eta_2 + c\mu(\nu - \psi)(\lambda\mu - \phi\chi)\eta_3}{2\Delta_3}$$

\therefore ind $\mathbf{B'C'}$ ind \mathbf{FG} ind $\mathbf{IN} =$

$$\begin{vmatrix} -\mu\nu & \lambda\nu & \lambda\mu \\ \mu\nu - \chi\psi & -\lambda(\nu - \psi) & -\lambda(\mu - \chi) \\ -\mu\nu(\lambda - \chi)(\nu - \psi) & \nu(\mu - \chi)(\lambda\nu - \phi\psi) & \mu(\nu - \psi)(\lambda\mu - \phi\chi) \end{vmatrix} \begin{vmatrix} abc\eta_1\eta_2\eta_3 \\ 8\Delta_1\Delta_2\Delta_3 \end{vmatrix}$$

On evaluation the determinant factor vanishes and therefore $\mathbf{B'C'}$, \mathbf{FG} and \mathbf{IN} are concurrent.

COROLLARY. By homology $\mathbf{A'C'}$, \mathbf{EG} and \mathbf{LK} are concurrent as also are $\mathbf{A'B'}$, \mathbf{EF} and \mathbf{HM} ; hence the triangles $\mathbf{A'B'C'}$, \mathbf{EFG} and \mathbf{OPQ} are coaxial.

XX. If the triangles \mathbf{ABC} , \mathbf{EFG} are in plane perspective, with $\mathbf{A''B''}$ as axis, and if $\mathbf{B' = AC \cdot BF}$, $\mathbf{C' = AB \cdot GF}$, $\mathbf{F' = EG \cdot BF}$ and $\mathbf{G' = EF \cdot CG}$, $\mathbf{B'C'}$, $\mathbf{F'G'}$ and $\mathbf{A''B''}$ will be concurrent.

$$\text{If } \text{ind } \mathbf{B'} = \frac{\lambda\epsilon_1 + \nu\epsilon_3}{\lambda + \nu}$$

$$\text{ind } \mathbf{C'} = \frac{\lambda\epsilon_1 + \mu\epsilon_2}{\lambda + \mu}$$

$$\text{ind } \mathbf{A''} = \frac{m\epsilon_2 - n\epsilon_3}{m - n}$$

$$\text{ind } \mathbf{B''} = \frac{n\epsilon_3 - l\epsilon_1}{n - l}$$

$$\text{then will } \text{ind } \mathbf{F'} = \frac{\lambda\sigma\epsilon_1 + \mu(\sigma + l n)\epsilon_2 + \nu\sigma\epsilon_3}{(\lambda + \mu + \nu)\sigma + \mu l n}$$

$$\text{and } \text{ind } \mathbf{G'} = \frac{\lambda\tau\epsilon_1 + \mu\tau\epsilon_2 + \nu(\tau + l m)\epsilon_3}{(\lambda + \mu + \nu)\tau + \nu l m}$$

in which $\sigma = \lambda n + \nu l - lm$ and $\tau = \lambda m + \mu l - lm$

$$\therefore \text{ind } \mathbf{B'C'} = \frac{-a\mu\nu\eta_1 + b\lambda\nu\eta_2 + c\lambda\mu\eta_3}{2\Delta_1}$$

$$\text{ind } \mathbf{A''B''} = \frac{amn\eta_1 + b\lambda n\eta_2 + c\lambda m\eta_3}{2\Delta_4}$$

$$\text{ind } \mathbf{F'G'} = \frac{(a\mu\nu(lmn - m\sigma - \nu\tau)\eta_1 + b\lambda\nu m\sigma\eta_2 + c\lambda\mu n\tau\eta_3)}{2\Delta_5}$$

On forming the product of these three index-values, the determinant factor will be found to vanish and therefore

$$\therefore \text{ind } \mathbf{B'C'} \text{ ind } \mathbf{F'G'} \text{ ind } \mathbf{A''B''} = 0$$

$\mathbf{B'C'}$, $\mathbf{F'G'}$ and $\mathbf{A''B''}$ are concurrent.

COROLLARY 1. By homology $\mathbf{A'C'}$, $\mathbf{E'G'}$ and $\mathbf{A''B''}$ are concurrent as also are $\mathbf{A'B'}$, $\mathbf{E'F'}$, and $\mathbf{A''B''}$; hence the triangles $\mathbf{A'B'C'}$, $\mathbf{E'F'G'}$ are uniaxial with the triangles \mathbf{ABC} , \mathbf{EFG} .

COROLLARY 2. Hence the triangles $\mathbf{A'B'C'}$, $\mathbf{E'F'G'}$ and $\mathbf{O'P'Q'}$, are concentric and their axial lines coincide with the axial lines of \mathbf{ABC} , \mathbf{EFG} and \mathbf{OPQ} .

Propositions XV to XX are true for figures on any homoeomeric surface, whether spherical, pseudospherical or plane.

[The remainder of this paper as presented, consisted of four parts:—

1st. A statement of the changes of interpretation of the symbols of magnitude in propositions I to IV necessary to render the proofs of propositions XV to XX valid for any homoeomeric surface.

2nd. An exposition of the geometry of Pascal's Hexagramma Mysticum for any homoeomeric surface, in which Pascal's, Steiner's, Kirkman's, Cayley's and numerous related theorems and their duals were deduced immediately from propositions XV to XX; accompanied by tables exhibiting the relations of the various lines and points determined by the theorems.

3rd. A statement of the chief theorems of the modern geometry of the triangle in the notation of trilinear and tripunctual indices.

4th. The enunciation of the postulates determining the interrelations of point, line and plane indices in the geometry of homaloid space of three dimensions. This part will be developed into a separate paper.]

Transactions of The Royal Society of Canada

SECTION IV

SERIES III

JUNE 1916

VOL. X

PRESIDENTIAL ADDRESS

Notes on the Geology of Nelson and Hayes Rivers

By J. B. TYRRELL, M.A., F.R.S.C., &c.

(Delivered May Meeting, 1916.)

Nelson river, with its main tributary the Saskatchewan, is one of the largest rivers in Canada, being exceeded in length only by the Mackenzie, St. Lawrence, and Yukon, and in the size of its drainage basin only by the Mackenzie. One hundred and fifty miles below Lake Winnipeg, at the outlet of Sipiweske Lake, its flow was measured by Mr. A. R. Dufresne, an engineer in the employ of the Canadian Government, on the 6th of October, 1909, and it was found to carry 118,000 cubic feet of water per second. The water was low at the time, and it is estimated that in periods of high water its volume would amount to double these figures. It has many large branches, such as the North and South Saskatchewan, Red, and Winnipeg rivers, all of which meet and mix their waters in Lake Winnipeg, which forms a vast storage and settling basin, and from it Nelson river proper flows in a moderately clear and fairly constant stream. At first it runs northward in a very irregular branching channel or series of channels, around many rocky islands and through a number of lakes to Split Lake, where it is joined by Burntwood and Grass rivers from the west. From the mouths of these comparatively small affluents it turns abruptly eastward, adopting their course, and flows in a single channel for 200 miles to Hudson Bay. Here the valley is in some places between one hundred and two hundred feet in depth, and its banks, which are of clay, rise steeply to the level of the adjoining plain.

Hayes river empties into Hudson Bay just east of Nelson river, the mouths of the two streams being separated only by a long narrow swampy and marshy point a few miles in width. It is about 300 miles in length on the usual travelled route from Painted Stone

Portage through Oxford and Knee lakes to its mouth, but its greatest length from the head of God's river and through God's lake is about 400 miles. It has a drainage area of 35,000 square miles, all of which is within the forest region, and a run-off of something like 15,000 cubic feet per second. Its upper branches drain an exceedingly rocky country, but nearer its mouth the surface is entirely composed of sands and clays of glacial and post-glacial age. At first it cuts through these superficial Recent deposits to the underlying rock, but farther down the stream it has been unable to reach this rock, though in some places it has cut its valley down to a depth of 180 ft. It is still actively deepening its valley and cutting away its banks, but not everywhere to the same extent, for while in some places it is overhung by steep scarped cliffs, in other places it flows past or between low alluvial flats and terraces which occupy the bottom and sides of the valley, and behind which the banks rise in rounded slopes to the level of the surrounding country. Thus while the valley is still young, it is of a much more mature character than that of Nelson river to the northwest of it.

HISTORY

Nelson river was discovered by Sir Thomas Button in 1612, when in the "Resolution" and "Discovery," two ships of about 55 tons, he sailed from England to Hudson Bay to look for Henry Hudson, who had been set adrift by mutineers somewhere in the Bay the year before, and also to try to find a northwest passage to China and the Indies. On the 15th of August he entered the mouth of the river with his ships, and although it was still so early in the season, he decided to remain for the winter, and he established his winter quarters at the mouth of a small stream on the northwest side, which is now known as Heart Creek. During the winter his crew suffered severely from scurvy, and Francis Nelson, his sailing master, and mate of the "Resolution," died and was buried somewhere on the bank. From him the river received its present name. In July, 1613, the party had been greatly depleted by sickness, and it would appear that the "Resolution" had been injured by ice, for it was abandoned, and Button with the remaining members of both crews sailed for England in the "Discovery."

In August, 1912, just 300 years after Button landed at Heart Creek, I was at the same place, and with me was a man who picked up a small three-pound cannon ball, much rusted, which probably came from one of the piles of cannon balls that this early explorer left behind him.

In 1631 Luke Fox, in a ship of 70 tons called the "Charles" entered Nelson river, and ascended it to within six miles of Seal

Island, where he overhauled his ship at the mouth of one of the small valleys on the north bank. A mile below his anchorage he found numerous remains of his predecessor's visit, piles of cannon balls, chains, anchors, etc., and a piece of board with an inscription written on it by Button himself.

In 1669 Captain Newlands along with Pierre Radisson, in one of the ships of the newly organized Hudson's Bay Company, visited the estuary of Nelson river, and in the years 1670 and 1673, on behalf of the same Company, Des Groseilliers sailed into the mouth of the river with the hope of establishing a trade in furs with the Indians, and in the latter year he found many remains of Button's visit in 1612 with relics of the ship abandoned by him.

In 1680 they were followed by Captain Draper of the same Company with the object of trading with the Indians.

In 1682, according to an account by De la Potherie, Radisson and Groseilliers, who at this time had left the service of the Hudson's Bay Company, and had sworn allegiance to the King of France, reached Hayes river and built Fort Bourbon on its northwest bank, apparently on the site of old York Factory. However, the Frenchmen were not to remain long alone, for three days after their arrival Ben Gillam, a young Captain from Boston in America, arrived and ascended Nelson river, where he built a fort on the north end of an island which has since been known as Gillam Island, while shortly afterwards Ben Gillam's father Zachariah Gillam, and Governor John Bridgar entered the same river in the interest of the Hudson's Bay Company, and built a trading post somewhere on the northwest bank. Before the close of the winter Bridgar and his men, and Ben Gillam and his men were prisoners in the hands of the French, their two forts were burned to the ground, and in the following summer they were taken to Quebec, while Groseilliers left his son in charge at Fort Bourbon. On a later page the site of Ben Gillam's fort is more fully described.

Another account by M. Jeremie, who lived at Fort Bourbon from 1697 to 1714, states that Des Grosseilliers learned of the presence of the English competitors during the winter of 1682-3.

After the departure of his father and Radisson young Groseilliers left Fort Bourbon and retired a few miles up Hayes river, where he built a trading post or small fort on an island. The exact position of this fort is not known, but it is probable that it was on the island marked on present maps as Rainbow Island, which is still known to the Indians of the vicinity as Pakowemistikusha Menistik or Frenchman's Island.

In 1684 Radisson renounced his allegiance to the Crown of France, and again entered the service of the Hudson's Bay Company, after which he sailed from London to the mouth of Hayes river, accompanied by Governor Phipps, who had been appointed by the Hudson's Bay Company to succeed Bridgar. On his arrival he informed Groseilliers' son of his action, obtained his co-operation, and then took possession of Fort Bourbon and all its contents on behalf of the Company, after which he sailed for England.

The same year the French, under M. de la Martiniere, built a small fort on the east bank opposite York, in the mouth of a small stream called Gargousse Creek, probably the stream now known as French Creek, and occupied it for one winter, but in the following spring, having been unsuccessful in their trade with the Indians, they burnt and abandoned it.

For ten years Fort Bourbon, or York as it was now called, remained in the possession of the Hudson's Bay Company under the British Flag, though it was attacked by D'Iberville in 1690.

In 1694 D'Iberville returned to the attack, this time with success, for he captured the fort on the 14th of October, the day of Ste. Therese, and in consequence he changed the name of the Hayes river to Riviere Ste. Therese.

It was retained by the French for two years, when it was recaptured by the British.

In the following year (1697) D'Iberville returned, and after a sanguinary engagement, in which he defeated a British fleet of three vessels, the largest of which he sank, while he also lost his own vessel, he presented himself before York Fort, which surrendered to him. The Indians of the vicinity still relate the story of the great number of corpses which were thrown up on the shore after this naval battle.

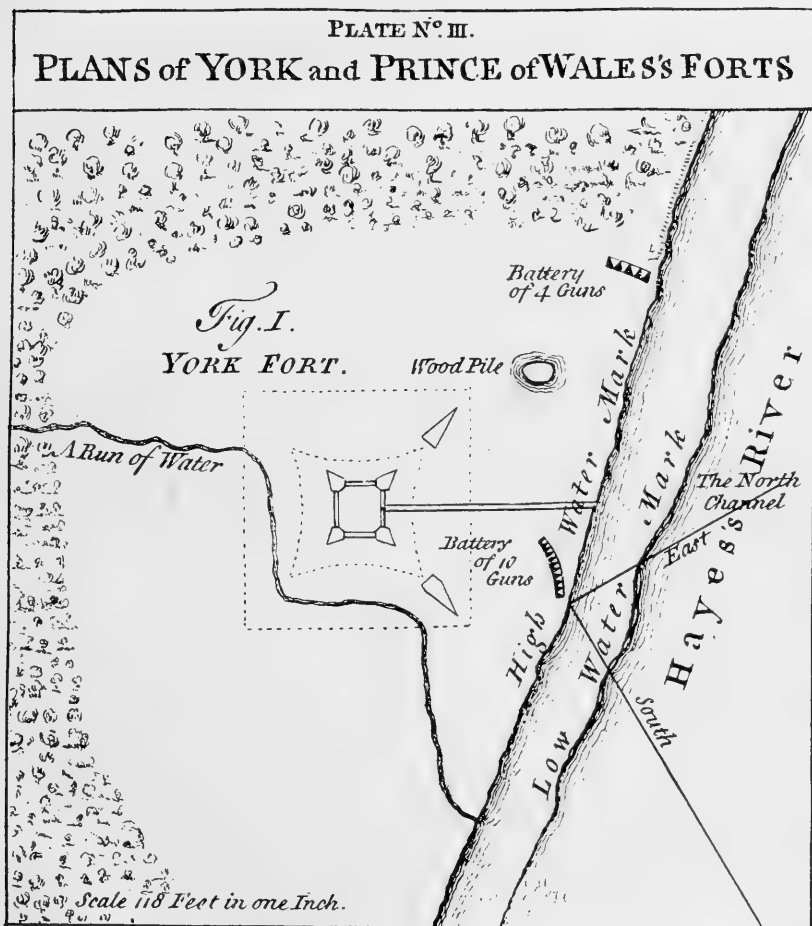
York Fort, again known as Fort Bourbon, remained in possession of the French until after the treaty of Utrecht in 1713, when it was restored to the British, and in the following year it was reoccupied by the Hudson's Bay Company.

In 1700, while the French were in possession they built another fort and large storehouse, which they named *Fort Phelipeaux*, on the southeast side of the river, two leagues above Fort Bourbon, to serve for retreat in case of attack by enemies; but it was sacked and destroyed by the Indians in 1712, after they had killed seven of the French who were hunting cariboux a few miles farther up the river.

York Fort was at that time situated on the northwest bank of Hayes river, half a mile below the present site of York Factory. It was occupied by the Hudson's Bay Company until 1782, when it

was again taken by the French under La Perouse, who burnt it to the ground, and carried off Humphrey Martin, the governor, and some of the employees to France, but in the following year the country was restored to the British, and the fort was rebuilt and reoccupied by the Hudson's Bay Company.

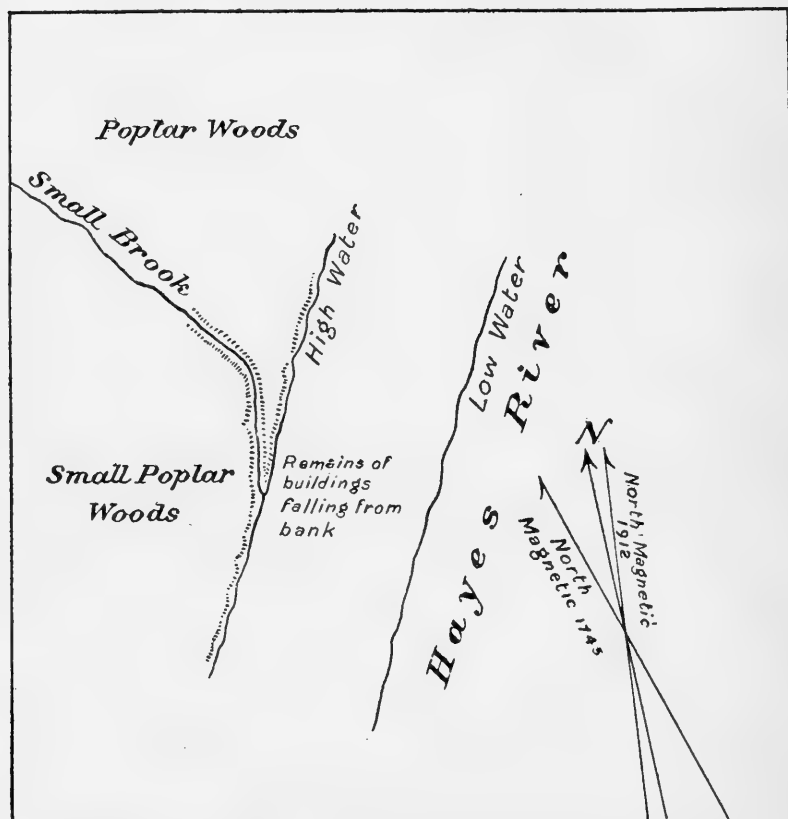
In 1745, Joseph Robson, an engineer in the employ of the Hudson's Bay Company, surveyed the mouths of the Nelson and Hayes



Plan of old York Fort. Joseph Robson, 1745.

ivers, taking his bearings with a compass, with proper corrections for magnetic variations, and measuring his distances with a wheel, the circumference of which had been accurately determined. Robson's

published maps and descriptions have been our principal sources of information about the geography of the mouths of these two streams until very recent years.



Site of Old York Fort in 1912

Scale - 118 ft. = 1 inch



Plan of site of old York Fort, 1912.

After the fort had been reerected on the old site in 1783 it was occupied for five years, when Joseph Colen, who had succeeded Humphrey Martin as governor, decided to move to somewhat higher land half a mile farther up the river, so he commenced to build on the site of the present York Factory, and by 1792 the new buildings were completed, and the staff of clerks and employees was moved into

them. After the removal of the buildings the old location was used as a cemetery. The land at the new site has an elevation of twenty-five feet above the top of high tide, which is about five feet higher than that at the old site.

From this time onward until the Canadian Pacific Railway was built across the continent York Factory was the central depot from which supplies were distributed southward to the Red River valley and westward to the Saskatchewan and Mackenzie valleys and even across the mountains to British Columbia and the Yukon Territory.

PHYSIOGRAPHY

Nelson river rises in Lake Winnipeg, which forms a great reservoir or catchment basin for the water of all its upper tributaries. The lake has an area of 9,414 square miles, and lies in the bottom of the old curved continental trough which extends around the margin of the Archaean protaxis of the continent. Unlike most of the other great Canadian lakes, however, its basin is continuous with a wide depression, which strikes directly northward across the protaxis, and through this depression it discharges its waters northward into Hudson Bay.

On its western side the land rises gently from a height of 714 feet above the sea at its shore to the summits of the Duck and Riding Mountains, with elevations of about 2,600 feet above the sea, the lowest 700 feet of this rise being an old lake floor which in places is washed clean to the underlying till or soft Cretaceous rock while in other places it is covered with sediment, either fine clay and silt deposited in still water, or sand and gravel distributed along ancient shore lines of the extra-glacial Lake Agassiz.

East of lake Winnipeg the land rises with an undulating surface contour to a height of about 1,500 feet above the sea near the sources of the Albany and Severn rivers. Most of this country is underlain by granites and metamorphosed schists with almost unweathered surfaces exposed over large areas. Unlike the country to the west, the surface is mammillated or lumpy, and the slopes are often covered with loose till or glacial debris, while the bottoms of the depressions are either hidden by a covering of moss or are filled with water. For a few miles back from the eastern border of the lake, where the land is not too high, a little stratified sand is usually present. All is covered with a continuous though usually scattered forest of spruce, larch, and poplar.

At its north end Lake Winnipeg is retained by a dam of glacial clay, probably morainic, which extends for about forty-five miles from granite knolls on the east to limestone cliffs on the west. At

the eastern end of this dam the lake overflowed and gave origin to the Nelson river, which at this point is still cutting into the clay dam and rapidly enlarging its channel.

North and northeast of Lake Winnipeg the country is underlain by Archaean rocks, with characteristic surface contour, the low rocky hills being separated by lakes and mossy swamps.

Such country extends northwards for several hundred miles, when rather suddenly the rocks begin to be covered with clay, and not long afterwards the rocky hills and knolls disappear entirely, and a vast level plain extends to the limit of vision. This plain, which reaches to the shore of Hudson Bay, and has an area of something like 100,000 square miles, is one continuous swamp covered with a thick water-soaked blanket of bog mosses with their usual association of northern swamp-loving plants. In order to define this swamp more clearly, and as it now covers an area which once formed part of the bottom of the ancient extended basin of Hudson Bay, I have elsewhere referred to it as the *Archudsonian Swamp*.¹ Unlike the country to the south of it, lakes are almost entirely absent, and the rivers flow in narrow channels cut into the clay-covered plain. Fish and wild animals are scarce, and consequently Indians who must depend on these for a supply of food, seldom attempt to make their homes in this swamp.

GEOLOGY

Pre-Cambrian

Rocks of Pre-Cambrian age underlie the whole country on the upper portions of both the Nelson and Hayes rivers, the lowest outcrop on the Nelson being 92 miles in a straight line from Beacon Point, while the lowest outcrops on the west and east branches of Hayes river, the latter known as God's river, are respectively 104 and 94 miles in a straight line from the same point. These rocks are chiefly granites and granitoid gneisses such as are usually included in the Laurentian System. Somewhere north or northeast of the mouths of these two rivers quartzites and other similar rocks, doubtless also of Pre-Cambrian age, must occur immediately beneath the drift, for the till transported from that direction contains large numbers of pebbles and boulders of such rocks.

Ordovician

Towards the north and east the Pre-Cambrian granites, etc., are overlain by flat-lying Ordovician limestones and dolomites. The

¹ Forests of the District of Patricia. By J. B. Tyrrell, Can. Forestry Journal, Feb., 1916, pp. 375-380.

contact was observed by Dr. Robert Bell on Nelson river, where the upper rock is a mottled dolomitic limestone of a light bluish-grey colour. Further down stream the Ordovician is represented by a buff coloured dolomite, mottled with yellow, the beds of which vary in thickness from two feet down to quite thin layers. These dolomites hold characteristic Ordovician fossils, while some of the beds contain in addition many flinty nodules. Dr. Robert Bell¹ also found similar limestone farther north on Churchill river, and I found somewhat similar coralline limestone overlying Pre-Cambrian quartzites on the west side of Churchill harbour.

On the western branch of Hayes river, down which we travelled to York Factory, no Palæozoic rocks of any kind were seen in place, and on the eastern branch, or God's river, none have been recorded as directly overlying Pre-Cambrian granites, etc., but on Shamattawa river, into which God's river empties before it joins the Hayes river, thin-bedded horizontal limestones outcrop in low shelving exposures for 17 miles along its banks, beginning at a distance, measured in a straight line, of 65 miles from Beacon Point. I was fortunate enough to be able to pay a hasty visit to the lower portion of this outcrop, and though fossils were not abundant, I collected representatives of 29 different species, which have since been described by Professor Wm. Parks of the University of Toronto. Nine of the species were found to be typical of the Ordovician rocks of Manitoba or elsewhere, twelve were new, and eight were specifically undeterminable.

East of this outcrop on Shamattawa river, these Ordovician rocks are, as far as we know at present, covered by drift for an indefinite distance.

Silurian

On Nelson river, at a distance of 62 miles in a direct line from Beacon Point² Dr. Bell records the occurrence of a yellowish-grey fine-grained dolomite, rather soft and earthy, containing obscure remains of "*Pentamerus*" (*Conchidium decussatum*?) probably of Silurian age. No rock in place has been recorded on Nelson river below this outcrop, but I found many irregular fragments or masses of dolomite of undoubted Silurian age near the mouth of Seal Creek, just above the head of tide water, some of which contained numbers of well-preserved specimens of *Conchidium decussatum*, with *Acerularia Austeni* and *Phragmoceras Nelsonense*, and also other fragments of fine-grained thin bedded argillaceous limestone which con-

¹ Report on Churchill and Nelson Rivers, by Robert Bell. Rep. of Prog. Geol. Sur., Can., 1878-9, Part C., Ottawa, 1880.

² Rep. of Prog. Geol. Sur. Can., 1877-8, p. 12 C.C.

tained several species of *Leperditia*. Whether these fragments had been derived from rock which may outcrop in the bed of the river near at hand, or had been transported from a distance it was impossible for me to determine in the time at my disposal.

On Hayes river no outcrops of Silurian rocks could be found, but on a stream called Machichi river, eight miles east of the estuary of Hayes river, angular fragments of thin bedded limestone, similar to the *Leperditia* beds above mentioned, were found in abundance scattered over the bed of the stream and along its banks, indicating the probability of its occurrence in place in the immediate vicinity.

East of Machichi river the next known outcrop of Silurian rocks is at Limestone Rapids on Severn river, where a heavy storm of rain and wind delayed us for a day. During that and on the following day when we were travelling up the Severn river, I collected many fossils, among which were representatives of 35 species already known from Silurian rocks elsewhere, 17 new species, and 34 species which could be referred to known genera though the material brought home was not sufficiently perfect for specific identification. The imperfection of the material was partly accounted for by the poor state of preservation of many of the fossils in the rock, but partly also by the fact that it was impossible for us to bring away more than a limited weight of material no matter how much we might collect. Many hundreds of miles of unknown country lay ahead of us that autumn before we would reach the outskirts of civilization at Graham on the Grand Trunk Pacific Railway; our necessary food, clothing, and bedding had to be carried in canoes, and after these things were aboard there was very little room for anything else, and besides there were only two places throughout the length of the journey at which supplies could be even partially replenished. In addition to these conditions everything, including the canoes, had to be carried on the men's backs over an unknown number of portages between those portions of the river and lakes which were navigable for canoes. The total number of these portages proved to be 103 with an aggregate length of 28 miles which of course had to be crossed with loads several times. Indian canoemen will carry canoes, food, blankets, or ammunition without a murmur, but they strongly object to carrying "stones" collected in the country. Finding that we had a little more ammunition than we should be likely to need I quietly left some of it behind, filled the ammunition bag with fossils, put some fossils in our bedding, and carried some without any attempt at secrecy, but nevertheless our carrying capacity was limited, and in many cases, when a species was large, it was often impossible to take with us more than one specimen, no matter how many had been collected or how abundant they were in the rock.

Devonian

In the vicinity of Nelson and Hayes rivers no evidence was observed of the presence of Devonian rocks, though away to the southeast, at the mouth of Albany river, Silurian limestones are conformably overlain by somewhat similar limestones of Devonian age, and it is not improbable that such rocks may have once existed on Nelson river and vicinity, but if so that they have since been eroded away.

Carboniferous-Tertiary

During this vast lapse of time, when the sediments which underlie the great plains of Saskatchewan and Alberta, and which largely compose the Rocky Mountains, were being deposited in the sea, this country would appear to have been standing above sea level, for sedimentary rocks, which would undoubtedly have been deposited in the seas of those times where such seas existed, are entirely absent. It was, therefore, a land area and as such was subjected to processes of oxidation and erosion which softened and disintegrated the previously formed rocks, and carried the disintegrated material down into the adjoining oceans. It was not only a land area, but it would appear to have been then as now very free from any violent orogenic or volcanic disturbances, for igneous rocks of Palæozoic or post-Palæozoic age are conspicuously absent.

Just before the Pre-Cambrian rocks sank beneath the Ordovician sea, where Ordovician limestones were deposited on them, their surface had undoubtedly been reduced to a low-lying gently undulating peneplain. At the end of the Tertiary Period, after having been subjected to atmospheric and erosive influences since Devonian or Carboniferous times, the country had again been reduced to a gently undulating peneplain, the surface of which was undoubtedly weathered and softened to a considerable depth.

Glacial

While the surface of the land and the rocks underlying it were in the condition outlined above the Glacial Period began, and glaciers or ice-sheets accumulated on various points in Northern Canada and from these points spread out over the adjoining country. These ice-sheets increased and decreased, appeared, disappeared, and reappeared in different localities as time rolled on. As they moved outwards from different centres over different parts of the country they scraped away from the surface all the decomposed and loose rock that had accumulated during preceding geological ages, and also removed a certain small quantity of the hard undecomposed underlying rock,

and they carried this burden of rock debris and "shavings" along until they reached some low place where the ice was sufficiently buoyed up by water to allow the load of debris to sink and accumulate and thus to form till, or until other conditions might supervene which would cause till to be deposited in hollows beneath the glacier, or as sediment in low places in front of it where possibly its readvance might obliterate most of the evidence of sedimentation, or finally until it was completely carried away by streams flowing from the glacier. If the debris was dropped beneath the glacier it might possibly be stratified if the ice was actually floating on the water.

In cases where the ice may have advanced over sediments deposited in water it undoubtedly tended to spread these deposits over the inequalities of the surface if such existed, and so while we would find an undulating surface of till over an undulating rock surface, we might expect to find a fairly level surface of till over a level floor of rock. Thus the even surface of till underlying the Archudsonian Swamp is itself probably underlain by a fairly even rock floor.

The till under this great swamp is a highly calcareous clay composed of subangular grains of quartz and limestone mixed with a large quantity of decomposed argillaceous material. It contains many small fragments of marineshells, as well as many small imperfectly rounded pebbles. It also contains a number of boulders, some of which are distinctly polished and scored with glacial grooves and scratches. The boulders are chiefly of granite and Palæozoic limestone, but some are of a very characteristic quartzite weathering with light coloured depressions, while others are of red conglomerate, white and red sandstone, diabase, banded jaspilite, etc. It is unstratified, and often breaks into small angular fragments along short vertical joints. In some places it is distinctly divided into upper and lower portions by a horizontal plane or by stratified sands which may contain layers of moss and lignite giving evidence of very shallow water conditions, or the immediate proximity of a shore during the temporary retirement of the glacier which formed the till. Where now exposed this bed of sand with moss and lignite hundreds of feet below the highest old post-glacial shore line indicates that the land stood higher during the period of deglaciation than afterwards. It probably raised on the retreat of the ice, and then sank again with its last advance down at least to the level of the highest beaches, and possibly considerably below that level.

On the Nelson river till is well exposed both in cliffs beside the stream, and on the hard tidal flats.

Beginning at the shore of Hudson Bay and ascending the river which gradually narrows from a width of twelve miles at its mouth to a mile and a quarter at the head of tide water below Seal Island,

the banks on the east side are at first low, with a well defined gravel beach just within the limit of the trees, while on the west side from Root Creek northward is a wooded plain six feet above high tide. A short distance west of the mouth of Root Creek is an escarpment 25 feet high, rising to a second wooded plain. A mile southwest of Root Creek this second plain reaches the bank of the river where it presents a naked cliff to a height of 31 feet above high tide mark. This cliff is composed entirely of unstratified light grey till, studded with glaciated pebbles, and with a few boulders showing themselves here and there on its face.

The cliff continues from this point up the northwest bank of the river, rising somewhat gradually, until at Flamborough Head, nine miles above Root Creek, it has reached a height of 90 feet. Throughout the distance it is chiefly composed of a homogeneous mass of till, but at Flamboro' Head itself the upper twenty feet consist of stratified marine sands with many well preserved shells.

Above Flamboro' Head the bank maintains the same general character, and at the mouth of a small brook opposite Gillam Island, where it is 85 feet high, is composed of 70 feet of brownish unstratified till, overlain by 15 feet of marine sands and clays with many shells.

The section on the southeast side of the Nelson river is very similar to that on the northwest side, though near the mouth it is not so well exposed, for the stream is not now striking against it and cutting it down. Opposite Flamboro' Head, and thence up to Seal Creek, the cliff, which has a height of 80 feet, is steep and bare, and consists of unstratified till, overlain by a few feet of moss or peat.

The river fills the whole channel between the steep cliffs on either side, and from the summits of these cliffs the land extends back from the valley in both directions as a level moss-covered plain.

Gillam and Seal Islands, which lie in the middle of the river four miles above Flamboro' Head, are, like the banks on both sides, about 80 feet high, with level summits covered with an even blanket of moss, showing clearly that they have been recently cut off from the shore, in fact so recently that the general covering of moss was formed over the plain before they were separated from it. These islands are composed throughout of till, like the bank to the south, and the marine sands so well exposed on the north bank are absent. Above Gillam Island cliffs of till form both banks of the river as far as I could see.

At the mouth of Seal Creek, and at the north end of Gillam Island, are terraces 25 feet above the river whose significance will be discussed on a later page.

Till is not only well exposed in the cliffs beside the river, but many of the tidal flats show a hard, cleanly washed surface of the same material dotted over with a few boulders. On these flats one can walk with comfort anywhere when the tide is out. Just at the mouth of Nelson river some mud derived from the cliffs bordering the tidal estuary is being deposited in quiet water near the shore, but in the channel, where the tidal currents are strong, the bottom is doubtless composed of hard, undisturbed till.

On Hayes river, whose waters join those of Nelson river as they flow into Hudson Bay, the section is somewhat different from that on the latter stream. As on the Nelson river the stream is actively cutting a cliff along its western bank near its mouth, but in this instance the cliff is of stratified marine sand and clay and not of till, and it was not until Pennycutaway river was reached, at a distance of 32 miles from the Bay that till was first seen. Here the cliffs are 90 feet high above a sloping beach of boulders, many of which are striated. At the bottom of the cliff is a thickness of 10 feet of unstratified brownish till holding many small fragments of marine shells, above which is stratified brown sand, then light blue sandy clay, and then brown sand on top with a basal layer of boulders, some of which are striated.

Thence southward to the forks of Steel and Shamattawa rivers the valley is bounded by steep banks on both sides, the bottom usually of till, while the upper portions are of marine sands and clays.

At the mouth of Steel river the following section is exposed on the northwest side of the valley just above the forks:

	Feet
Marine sand with shells	10-20
Unstratified till ? with pebbles.	40
Stratified sand carrying much water. This water-bearing bed causes many of the large slides on the sides of the valley.	10-20
Unstratified till with pebbles of greenstone, limestone, granite, red quartzitic sandstone, etc.	50

This till extends down to the bottom of the bank where many striated boulders are lying.

A short distance further up the river the bank of similar height is composed entirely of stratified clays and sands, till being absent.

Thence up to the mouth of Fox river the banks average 100 feet in height, chiefly stratified sands, though till appears at the bottoms of the cliffs in the upper portion of this course. At the mouth of Fox river the cliff is 70 feet high, all but the upper 12 feet of which is till.

Fox river is 180 yards wide at its mouth, but its banks have not yet been examined, while Hill river, which joins it from the south, and down which we travelled, is only 95 yards wide at its mouth.

In ascending Hill river the banks for about 12 miles are 60—80 feet high, being composed of till overlain by stratified sands. Above this they rise within a few miles to heights of 180 feet, where they are composed entirely of till, and from there upwards to *The Rock* they are high, and though they were not closely examined, they seemed to be composed entirely of till. The valley itself is very new, being still in the stage of active downward erosion. The banks are steep, and there are no flood plains, except at the mouths of small tributary brooks, none of which cut through the little flood plains, but flow into the river over them.

Now returning to the mouth of Shamattawa river and following it upwards, the banks are at first of till overlain by stratified sand and gravel, but farther up stream they rise to heights of 170 feet, and are composed of till, on top of which is an old gravel beach with an elevation of about 300 feet above the sea. When well exposed in scarped cliffs this till is seen to be divided into an upper and lower portion by a horizontal line which is usually from 30 to 50 feet above the bottom of the cliff, or at an elevation of 130–150 feet above sea level. A similar subdivision occurs in the till on Severn river. In this dividing line or plane there is often a layer of coarse interglacial sand and gravel from an inch or so to two feet or more in thickness. In the sand, and occasionally in the till for two or three feet above it, are fragments of wood, and pieces of moss slightly darkened in colour, clearly indicating shore or very shallow water condition at the time of deposition of this sand. The presence of the wood in the bottom of the upper till, and of the sand beneath it, would also indicate that while the glacier incorporated into its till some of the wood which had been in the sand, it had not sufficient power to crush or remove all the sand. It is also evident that, as stated on page 16, this old interglacial land surface was about 300 feet or more below the level to which the water of Hudson Bay rose in later glacial or post-glacial times.

At Limestone Rapids, a little farther up Shamattawa river, the till overlying the limestone decreased to a thickness of about 30 feet, apparently entirely the lower till.

This was as far as it was possible for me to examine this interesting river.

On Machichi river, which flows into Hudson Bay a short distance east of Hayes river, cliffs of till up to 60 feet in height bound the valley, while the newer marine sands and clays are conspicuously scanty.

Glacial Grooves and Striae

On Hayes river the most northerly glacial markings observed were at "The Rock" where two sets, probably not very different in age, run S. 65° W., and S. 85° W., respectively, while these are over-ridden and almost obliterated by a later set running S. 20° E. Much of the surface was scored and polished by this last glaciation so that its direction and its relationship to the earlier glaciations were quite unmistakable, but nevertheless it was not observed on any rocks farther south on Hayes river, so that either it did not extend much farther south than this point, or it did not move the till or reach down to the underlying rock at any of the places examined by me, for while a first glaciation will usually score the underlying rock a second glaciation will not necessarily do so unless it either moves or removes the older till.

At the outcrops of Ordovician limestone which I examined on the Shamattawa river the surface of the rock was everywhere rough and weathered, and no glacial markings could be discovered.

Farther east, on Severn river, two distinct sets of glacial grooves and striae were conspicuous, one bearing a few degrees east or west of north, and the other and later set bearing S. 60° W.

Different Periods of Glaciation

I have elsewhere shown that there were at least three periods¹ during which this country was more or less completely covered with ice, namely the Patrician, Keewatin, and Labradorean periods. At that time the Keewatin glaciation was thought to be the oldest of the three, but further consideration has led me to the belief that the Keewatin glacier, at least in its terminal stages, was later than the Patrician glacier. In order of time therefore we would have 1st, a Patrician Period during which the ice spread out from a centre in the country between Hudson Bay and Lake Superior, northward into the basin of Hudson Bay, westward across the Hayes and Nelson rivers, and doubtless also southward towards Lake Superior and Lake of the Woods; 2nd, a Keewatin Period when the ice accumulated on a centre west of Hudson Bay and north of the Churchill river, and moved southward and southeastward down to and over the basin of Lake Winnipeg and the plains of southern Manitoba; and 3rd, a Labradorean Period during which the ice moved southwestward across the southern portion of the basin of Hudson Bay as far as Lake Winnipeg, overriding the marine deposits in the bottom of the Bay and shoving a certain portion of them to and over the country to the

¹ Hudson Bay Exploring Expedition, 1912, by J. B. Tyrrell. 22nd Report Ontario Bureau of Mines, Toronto, 1913.

south of it. The thick heavy beds of compact till which underlie the country south of the Bay are here tentatively ascribed to the influence of the last of these glaciers which is believed to have moved and kneaded up the previously existing marine deposits that had been spread out over the sea floor probably during the closing epochs of the Patrician or Keewatin periods. It is possible that the lower till on the Shamattawa river may have been formed by the Keewatin and the upper till by the Labradorean glacier, but two similar tills are found on Severn river, and other streams farther east, where they were probably both formed by two separate advances of the Labradorean glacier, so it is perhaps more probable that the two tills on the Shamattawa river were formed in the same way.

Extra-glacial Lakes

Lake Agassiz was the greatest of these. It was ponded in front of the coalesced faces of the Keewatin and Labradorean glaciers, and at various stages of its existence covered a great extent of Manitoba from the Churchill river southward to and beyond the International Boundary Line. In its higher stages it drained southward into the Mississippi river, but in its lower and later stages it would appear to have either drained northward into Hudson Bay along the edge of the ice sheet, or, as we shall see later, to have actually formed an arm of Hudson Bay.

In the vicinity of Oxford and Knee lakes a body of water, which we may call *Hyper-Oxford* lake, appears to have been ponded in front of the retiring Labradorean glacier. The evidence of its presence consists of beds of sand and clay which lie around the shore of the lake, and rise about thirty feet above it. As the lake is 585 feet above the sea the summits of these sandy terraces would be approximately 615 feet above the sea. They have every appearance of having been formed around a tongue of the glacier which filled the basin of the lake at the time.

Chacutinow or The Hill, which rises 461 feet above Hill river at its foot, or 900 feet above the sea, is composed of fine, well rounded gravel, but it is probably an esker which has been formed near the face of the Labradorean glacier.

Post Glacial Deposits and Elevation of the land

As the climate ameliorated towards the close of the Glacial Period the ice of the Labradorean glacier melted away, and its front retired northward, while at the same time the land on which it had rested gradually rose. It is not yet known to what extent the land was depressed when the glacier covered the whole country south-

westward to Lake Winnipeg and Lake of the Woods, but when its front had retired to within about a hundred miles of the present southern shore of Hudson Bay, it was approximately between 400 and 500 feet below its present level, for about that time the salt water of the Bay or of the ocean flowed round in front of it, and in this salt water stratified marine sands and clays began to be deposited. It is quite possible, however, that before the ice had retired to this extent, and when it covered a very much larger area, the land under and around it may have been depressed much more than this, in which case Lake Agassiz in its later stages may have been at sea level, and may have been connected with ocean water in the basin of Hudson Bay along the western face of the Labradorean glacier.

As the front of the glacier continued to retire the land continued to rise, though what was the exact relationship between the rate of retirement of the glacier and the rate of rise of the land is not known.

The floor of till on which the glacier rested before its retirement was remarkably level throughout most of the country near the Bay, but there was a decided valley or depression along the line of the present valley of Hayes river. I do not know how this old valley was formed. Possibly the surface of the till conforms in a general way to the contour of the underlying rock floor, or it may have been formed in Interglacial times, and the lignite-bearing beds of sand between the upper and lower tills may be in some way connected with it. Certainly it was not formed by erosion in Postglacial times.

As the strip of sea between the glacier and the land continued to widen, sediment was being discharged by the glacier and streams flowing from it, and by streams flowing from the land to the south from which the ice had recently retired, and this sediment was spread more or less evenly over the sea floor, filling its inequalities and reducing it to a level plain which now has a gentle slope northward of 5 feet to the mile. At that time mollusca of various northern species inhabited this sea, and many of the beds of sand and clay contain their shells in abundance.

These beds are, as far as I am aware, most fully developed on the banks of Hayes river, where they were deposited in the old valley or narrow bay above referred to. I would, therefore, propose for them the name *Hayes River Series*, merely as a local designation to facilitate description, and to distinguish them from similar beds elsewhere. They were probably formed at the same time as the Champlain Clays and Sands of the St. Lawrence valley.

Near the mouth of Hayes river, where the scarped bank rises 20 feet above the top of the beach, the upper 10 feet is composed of stratified sand containing a few marine shells, and with a layer of

pebbles and boulders at the bottom; below which is 10 feet of dark stratified clay through which are scattered a few pebbles and marine shells.

From here the cliffs gradually rise till at the mouth of Pennycut-away Creek they attain heights of 90 feet, being composed at the top of the above mentioned layer of brown sand 10 feet thick with its basement of pebbles and boulders, below which is light blue sandy clay and stratified brown sand down to the till.

A few miles farther up on the west side of Hayes river are cliffs also 90 feet high showing the following section:—

	Feet
Marine sand and gravel.....	12
Soft clay showing very little stratification, but containing many very perfect shells of <i>Cardium</i>	10
Sand.....	5+
Brown sandy till with pebbles.....	5+
Blue clayey till.....	5
Covered to water.....	15

Similar cliffs, though usually much slidden and with very imperfect exposures, continue up the valley on the outer sides of the bends of the stream. Seven miles below the mouth of Shamattawa river the following section was seen on the west bank

	Feet
Horizontal brown sand.....	6
Gravel with many shells.....	10
Brown sand.....	15
Soft unctuous blue thinly stratified clay.....	13+
Fine brown sand.....	20+

to water's edge.

Opposite the mouth of Shamattawa river there is a bed of marine sand 10 or 20 feet in thickness on top of a cliff of till 100 feet in height. Above this point to the mouth of Fox river the valley of Hayes river is wide, and the banks are either sloping or are more or less completely covered with slides, but such sections as I was able to examine appeared to be chiefly composed of stratified marine deposits.

On Hill river marine deposits form the tops of the banks for a few miles above its mouth, after which they were no longer recognized.

On Shamattawa river marine sands, clays, and gravels form the tops of the banks for a few miles above its mouth when they entirely, or almost entirely, disappear.

On Nelson river stratified marine sands from 10 to 20 feet in thickness cover most of the higher cliffs on the west side of the

river as high up as a point opposite Gillam Island, above which Dr. Bell records the presence of stratified Recent deposits.

From the above brief description it will be seen that these Recent sands and clays were deposited near the shore of the sea (Hudson Bay) in a deep bay which was probably at the mouth of a large river. The presence of the boulders and pebbles in the sand and clay would at first appear to indicate the immediate vicinity of the face of the ice sheet when the beds were being laid down, but it is also possible that they may have been washed out of banks of till which formed the sides of the valley or bay in which these sediments were being dropped.

Beaches

As stated above, the land emerged from beneath the waters of Hudson Bay as a marvelously even plain. No sea cliffs were formed, and the shore line for the time being was marked by a regular and almost continuous gravel ridge, which was rarely broken except where a stream was flowing across it into the Bay. As the land rose gradually but spasmodically gravel beaches were formed in parallel series, each lower than the one just older than it, until a condition of stability seems to have been attained at the present shore line of Hudson Bay. This shore is marked by a gravel ridge, or series of two or three gravel ridges, which rise about 10 feet above the level of the tidal flat in front of them. The water reaches the outermost of these ridges at every flood tide, but in storms it evidently sometimes washes over it, for we found the remains of the wreck of the *Cam Owen*, lying on the second of these beach ridges just west of the mouth of Kaskatamagan river, where it had been thrown and broken to pieces by the waves. While this second ridge is thus occasionally reached by storm waters, it nevertheless represents a distinct shore line about 10 feet above the present shore. This shore line was most clearly seen on the west side of the estuary of Nelson river, near the mouth of Root Creek where it runs along the foot of a cliff about 25 feet high, at the back of a wooded flat which is now 6 feet above the level of high tide. The next older beach has a crest 40 feet above high tide. It can be seen back in the woods on the east side of Nelson river 15 miles up stream from Beacon Point. It was not observed on Hayes river, but on Machichi river, eight miles farther east, it is well developed as a strong dry gravel ridge on which is a trail much used by the Indians when travelling eastward through the country. On Severn river this gravel ridge is also strongly marked, and on it a Mission Church has been built.

The next higher beach is probably represented by the gravel deposit on the summit of Flamboro' Head with a height of 90 feet above high tide.

I did not observe any other and higher beaches on Hayes river and its tributaries until the summits of the hills overlooking the Shamattawa river were reached, where a strongly marked gravel beach at an approximate elevation of 300 feet above the sea occurs on the summit of a ridge of till. Above this elevation no old beaches were recognized in the vicinity of the river. On Chacutinow or "The Hill," which rises 461 feet above the river at its base, or to a height of approximately 900 feet above the sea, no old beaches were found, though its upper portion, which is of gravel, is ideally constituted for the preservation of such beaches.

The profile surveys of the Hudson Bay Railroad will doubtless furnish the elevation of many of the old shore lines of Hudson Bay. One of these old beaches is marked on the profile at miles 380, about the middle of Township 90, Range 3, East of the Second Meridian East and 3 miles north of Nelson river, with an elevation of 290 feet above sea level, corresponding closely with the Shamattawa beach.

On Severn river sections of gravel beaches and terraces were seen at several places on the tops of the banks as we passed in our canoes, but, unfortunately, it was impossible for us to stop to examine them, or to make any reasonably close determination of their character and elevation.

In the country north of Churchill river, and west of Hudson Bay I have already recorded the occurrence of old post glacial shore lines with the following approximate elevations in feet above the sea, viz.: 190, 220, 235, 260, 280, 310, 340, 360, 405, 430, 440, and 490; while at the head of Owl river, and to the south of Fox river on the winter route from York to Norway House, I estimated the height of the highest beach at 600 feet above the sea.¹ Doubtless the exact elevation of this latter beach will be determined before long by the surveys which are now in progress throughout that country.

Valleys

On the western branch of Hayes river, which is commonly used as a canoe route from Lake Winnipeg to York Factory, the stream does not flow in a well-defined valley until after it leaves Swampy Lake. Above that lake the country, with its rough uneven surface, is underlain by hard, unweathered rock, and the drainage flows into the depressions where it forms lakes. Over the lowest part of the rim of each of these lakes the water spills by a rapid or series of rapids into a lake at a lower level, thus forming a connected but tortuous

¹ Report on the Doobaunt, Kazan, and Ferguson Rivers, by J. B. Tyrrell. An. Rep. Geol. Sur. Can., Vol. IX, 1896. Pt. F., pp. 191-193, Ottawa Govt., 1897.

river. Even in the rapid stretches between the lakes the river has not cut any definite channel, and its waters often spread out for considerable widths on slightly depressed portions of the surface which are usually covered with boulders or angular masses of broken rock.

An interesting method of formation of rapids, or obstructions was observed in this as well as in many of the smaller rivers of this part of northern Canada, though the most typical examples that came under my notice were on Machichi river. The ice, when it breaks up in the spring of the year, shoves boulders along the river bed until they form a curved ridge with a steep face down stream. Then the water overflows at one side or end of the boulder ridge, and cuts out a channel more or less at right angles to the general course of the stream. Such boulder-ridges may be formed across the whole channel of the river, or only across part of it.

At Swampy lake, Hayes river enters a country covered with relatively soft Glacial and Post-glacial deposits that have filled the rock basins and buried the original hard rock surface under a soft superstratum of sand and clay. Swampy lake, which has an elevation of 500 feet above the sea, lies between ridges or plains of sand, and the river as it leaves it continues to flow over a bed of hard rock as before. The ridges are probably eskers, and possible also moraines, which were formed near the front of the Labradorean glacier during its retreat, rather than beach deposits formed on the shore of the extended Hudson Bay. A little farther down the stream the Recent clays, etc., become more regularly distributed, and the river has cut a deep narrow channel through them. As far as a point six miles below "The Rock" the trenching of the valley has been carried down to the underlying hard rock, but below that point the rock has not been reached, and the bottom of the valley, as well as the sides, is composed of glacial or postglacial sands or clays. In places the banks are as much as 180 feet high, but they are everywhere steep, for there has been scarcely any wearing down of the adjoining country and from the top of the bank one looks down into a gorge-like valley in one direction, while in other directions the country extends as an apparently interminable moss-covered plain. Hayes river, here locally known as Hill river, continues northward in this deep narrow valley until it joins Fox river coming from the west, which, though not very much larger than Hill river, is flowing in a much more spacious valley. From the mouth of Fox river the united streams adopt its valley, and flow north-eastward under the local name of Steel river. Occasional cliffs of clay and sand overlook the outer sides of the curves of the stream, while within the curves are alluvial flats, behind which the banks rise by well-marked benches or terraces to the mossy plain above.

Thirty miles below the mouth of Fox river, Hayes river is joined by the Shamattawa flowing from the southeast in a still wider valley, and from the junction of these two streams it turns and flows northward for fifty miles to its mouth in Hudson Bay. Like in its upper portions it does not here anywhere fill the bottom of its valley, but swings from bank to bank, first washing the foot of a steep naked cliff on one side and then the foot of a similar cliff on the other side, with alluvial flats opposite these cliffs. Occasionally the river would appear to have altered its course by cutting out a new channel through one of these alluvial flats, probably on account of the formation of a dam of broken ice in the spring across the old channel, in which case two channels may remain after the disappearance of the ice dam with an island between them that was previously a part of the alluvial flat. At the naked cliffs on the outer sides of the curves of the stream sand and clay continue to slide, or to be washed down, into the water by which it is carried along for some distance until it is dropped either to the bottom or on points or islands in the stream.

In its lower portion the valley of Nelson river differs in some important particulars from that of the Hayes. Like in the valley of the latter stream the banks are steep and often precipitous, but unlike it the river fills the valley from bank to bank not only in the tidal portion at its mouth, but as far as I could see upwards from the summit of Gillam Island. No bottom lands of any appreciable extent could be seen and there are no terraces along the sides of the valley, for the river above the head of tide water is at present actively engaged in undercutting both of its banks, and in deepening its channel from side to side. It is true that there are terraces at the mouth of Seal Creek and other tributaries, and at the north end of Gillam Island, twenty-five feet above tide water and apparently of the age of the Mission Beach, but they have only been preserved in protected localities where the river has not been able to reach them and to cut them away. Doubtless similar terraces existed at many places along the sides of the valley but they have been washed away.

Gillam and Seal Islands, which lie just at the head of tide water in Nelson river, also differ from any of the islands in Hayes river, in that they are composed entirely of till, and rise to the full height of the adjoining plain from which they have been cut off or separated by the river, doubtless assisted in the first place by a small stream which joins the main river immediately to the west of them.

The sizes of the two valleys are not at all proportioned to the sizes of the two streams which flow in them, for while Hayes river is only about one-eighth of the size of Nelson river the valley in which it flows is the larger of the two.

Some of the reasons which suggest themselves to account for the difference in size and character of the two valleys are as follows:— The valley of Nelson river was originally excavated by a stream no larger than, and perhaps not as large as the stream which at the same time flowed in the valley of Hayes river, and as the soft materials in which the two valleys were excavated were not very dissimilar in character the valleys themselves undoubtedly presented the same general characteristics, which were those of a stream without falls or serious rapids winding between or beside alluvial flats that rose by regular or terraced slopes to the level of the adjoining plain. Hayes river is quite competent to carve out the valley in which it now flows, while Nelson river is much too large for such a duty, and therefore in the lower portion of its valley which we are now considering it was once much smaller than it is at present. It may be that the overflow of Lake Winnipeg did not reach this portion of the valley of Nelson river at that time, but found its way to Hudson Bay by some other channel, and that we are here dealing with the lower valley of the united Grass and Burntwood rivers which flow from the west into the west end of Split Lake. These two streams together drain an area of 1,300 square miles west of Split Lake, and their waters united into one river would doubtless have been competent to cut out the original Nelson valley. We have already observed that fragments of the Mission Terrace, 30 feet above high tide level, occur in protected places in the lower part of the valley, where the present river is not able to reach and destroy them, and therefore it would appear probable that the smaller river, which we may refer to as the Burntwood river, occupied the valley down to the time of the Mission beach at least, and perhaps even to the time of the 10 feet beach. Then the volume of water was greatly increased, possibly by the junction of the stream flowing from Lake Winnipeg with the Burntwood river, and the enlarged stream adopted the valley of the latter river and followed it to Hudson Bay. At the present time it is actively engaged in widening and deepening that valley.

The naked precipitous cliffs of clay descending to the edge of the water are themselves sufficient evidence of the rapid erosion which the river is performing, but in addition a little bit of evidence was found which has a decidedly human interest. On the north end of Gillam Island is a wooded terrace which is bounded towards the north by a steep cliff 25 feet high descending to the water which is deep enough for a small ship. Here Ben Gillam brought his ship in the summer of 1682; on the terrace he built his fort and spent the winter of 1682–3, and in the spring of 1683 the fort was burnt down and abandoned. Most of its site has been washed away, but a little

angular mound was observed on the surface among the trees near the edge of the cliff, and where the end of this mound reached the cliff the layer of dark surface soil had evidently been broken and a close-set row of spruce posts about six inches in diameter had been planted upright in it to form a wall or stockade. A foot or so in length of the bottoms of these posts still remained, though very much decayed. The lower ends had been chopped off with an axe, while the upper ends had been burnt. Stones had been piled against the stockade and beside these was a thick layer of burnt clay, probably an old chimney, and in the clay I found an old hand-made nail, and part of the stem of a clay pipe. Under the burnt clay was a layer of charcoal.

The exact position of this little old fort with respect to the original brow of the cliff is not known, but in the period of 233 years since it was burnt, its site, with whatever land there may have been in front of it, has been almost completely washed away by the river.

We have already seen that no shore cliffs have been formed on the open shore of Hudson Bay, but within the tidal estuaries of the Nelson and Hayes rivers cliffs have been cut on the west banks while the east banks rise gently from the waters edge. These features are, however, not peculiar to the mouths of these two rivers, for they occur with perfect regularity in the mouths of all rivers which flow into the south and southwest side of Hudson Bay. These eastward facing cliffs are being constantly washed down by the waves that are lashed against them by storms at high tide. For the Nelson river I do not know of any data by which we can judge of the exact rate at which these banks are being worn away, but on Hayes there are records of two surveys which give us information from which we may judge of the rate of wear. In the year 1900 the Hudson's Bay Company had a reserve surveyed around York Factory, and posts were planted 75 and 20 feet respectively from the top of the bank. In 1912 the post at the north end was 35 feet from the top of the bank, 40 feet having been washed away, while the post at the south end had been washed away entirely, and a measurement from the back corner of the reserve showed that its former position was 15 feet out over the river, or that 35 feet of the bank had been washed away in the preceding 12 years, or at a rate of about 3 feet in a year.

The second case is of old York Factory which two centuries ago was situated on the bank half a mile below the present fort. In 1745 a survey was made of it and its surroundings by Joseph Robson and a map of that survey on a scale of 118 feet to an inch was published by him. By comparing this map with one which I made in 1912 it will be seen that two bends of the stream have disappeared and that the face of the bank is 168 feet farther back than it was

167 years before, or an average wearing back of almost exactly a foot in a year. Robson's Map, however, does not quite agree with the description which he gives of the site of York Factory, for while the former shows it only about 100 feet back from the river, the latter states that it was "about eighty yards from Hayes river." Now Robson was a builder, and as his published plan of Fort Prince of Wales on Churchill river has been found to be correct his plan of York is likely to have also been correct, though he may not have been quite so particular to mark its exact distance from the river bank. It is probable that his plan is more correct than his description, but if the latter is correct the bank has been worn back at the rate of 1 foot 10 inches a year during the above period.

It is interesting to note, too, that the deepest water just within the mouths of these two rivers is near the west bank which is being cut away, and it would seem probable that the deep channel is moving westward with the wearing back of the cliff which overlooks it.

From the facts and considerations above enumerated we can readily see why there are no natural harbors on the south coast of Hudson Bay. A gently sloping sea floor, in which there were no troughs or indentations, gradually rose from beneath the water; the streams draining the advancing land cut channels into it, but they scarcely reached the sea, and did not extend out under it; and the westward transgression of the mouths of the present rivers prevents the formations of even such channels as the water would cut if it were confined within narrow limits.

Churchill harbor is an example of what the water will do in making a channel even below sea level if it is not allowed to spread out. The harbour is a rock-bound basin which was filled with till or boulder clay up to the general level of the surrounding till covered plain. An interval of 1,100 feet between the rocks allowed the stream to flow from, and the tide to ebb and flow from and into the basin, and the till has now been scored out of this rock-bound interval or channel to a depth of 120 feet, while at the same time the ebbing tide has carried away the till and formed a fairly deep basin half a mile in diameter just within the rocky neck or mouth of the harbour. Possibly a little assistance with explosives applied to the till that remains within the rock-bound basin might enable the water that rushes out between the rocks at the entrance of the harbour with the ebbing tide to greatly enlarge the extent of the deep water.

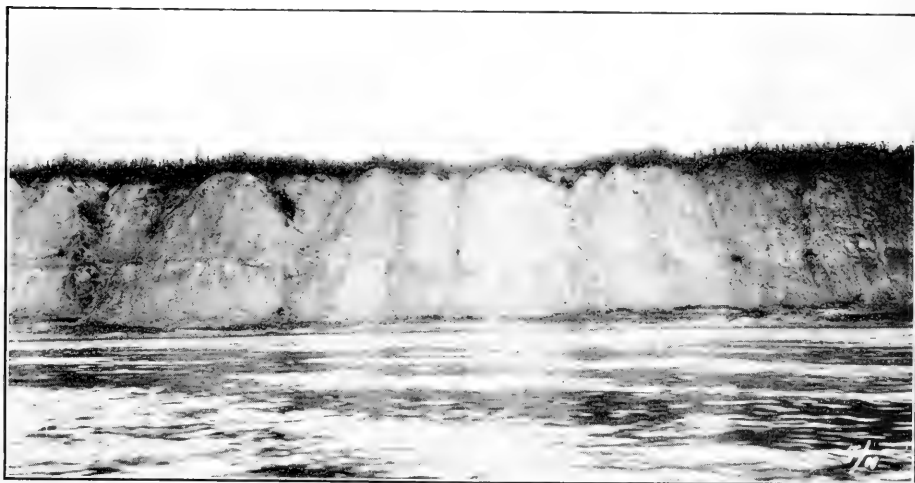
But there are no hard rocks to confine the waters at the mouths of the other rivers, and they spread out and clear a very wide instead of a deep channel.

The character and history of the growth of the land around Hudson Bay deserve much more study than they have yet received, and I feel quite convinced that the volume of new and valuable information which would be obtained from such a study would well repay the time and money spent on it.





4/5 Rocky upland country. Trees with their roots in the cracks of the rock.
Upper part of Hayes river.



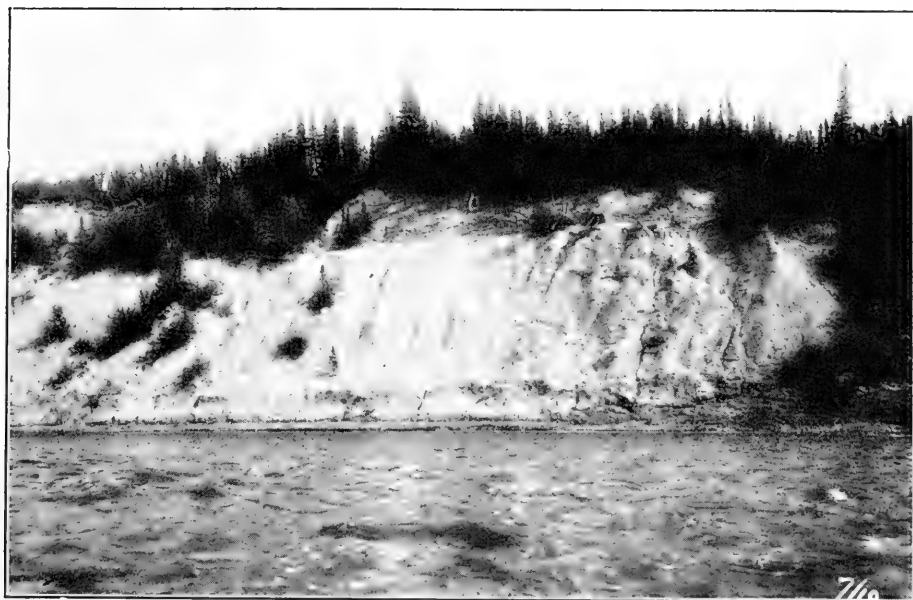
5/11 Upper and Lower Till with lignite-bearing sand between.
Shamattawa river.



1A Hard till with boulders scattered over it.
Low tide, east shore of Nelson river.



8/9 Glacial grooves running south 25° east on "The Rock," Hayes river, made by the
Keewatin Glacier.



7/10 Till overlain by Hayes River Sands
Cliff 60 ft. high on Hayes river 9 miles above the mouth of Fox river.



10 Hayes River Sands and Clays.
Cliff on west bank of Hayes river near its mouth.



11 Low sloping shore.
East bank of Hayes river near Ten Shilling Creek.



8/5 Seal Island, Nelson river.
A fragment cut off from the adjoining land.



6/12 Dam of boulders with steep face down stream and channel on one side.
Machichi river.



6/9 Summit of Brassy Hill, a high ridge of gravel.



1/3 Rocky upland country.
Painted Stone Portage, at head of Hayes river.



1/11 Ordovician Limestone, Shamattawa river.

Chondrodystrophia Fetalis: A Study in Development

By ALBERT G. NICHOLLS, M.A., M.D., D.Sc.

Professor of Pathology in Dalhousie University.

(Read May Meeting, 1916.)

The curious and very rare anomaly of development that I wish to discuss in the present communication has been variously designated fœtal rickets, pseudorachitism, cretinoid dysplasia, chondritis fœtalis, micromelia chondromalacica, achondroplasia, and chondrodystrophia fœtalis. The multiplicity of names that have been applied to the condition is an indication of the very diverse opinions that have been entertained as to its etiology. My preference is for the last, for reasons that may be inferred from the course of my remarks.

The affection is a form of dwarfism, which presents the following characteristic and differentiating features. The type of dwarfism is micromelic and the lesions are usually symmetrical. The body is plump, the head large, and the micromelia rhizomelic. There are, moreover, notable deviations from the normal in the length, curvature, and consistence of the bones of the extremities, and in the configuration of the skull. Not infrequently, the hands show the so-called "trident" deformity, the second, third, and fourth fingers being nearly of the same length, the second and third being approximated, and also the third and fourth. According to Kaufmann, who has made a careful study of the condition, there are two groups—one, in which there is a distinctly cretinoid appearance of the face and skull, viz., a deeply sunken nose, thick cheeks and lips, and a large mouth; another, in which the nose is flattened and retracted as a whole. Apart from these, which may be termed the "hall-marks" of the disease, there are others which are occasionally present, such as, osteoporosis, beading of the costochondral junctions of the ribs, cleft palate, lordosis, and polydactyly. Before passing on to the consideration of the factors at work in the causation of this highly interesting anomaly, I may, perhaps, describe a case, which I had the good fortune to meet with recently.

G. B., male, aged two years and eleven months; the sixth child of his parents, who were well formed and developed. He was born two or three weeks prematurely. I have no precise information, but, according to the mother's statement, there was probably hydramnios.

The child was a typical chondrodystrophic dwarf. The trunk was about the normal size for his age, but, as compared with the limbs, disproportionately long. The umbilicus was situated below the centre point of the body. The legs were short, measuring twelve inches from the crest of the ilium to the sole of the foot. The defect was mainly due to abnormal shortening of the femora, though there was also slight curvature. The arms were short, measuring ten inches in length, the defect here being likewise in the proximal portion of the limb. The tips of the fingers reached only to the crest of the ilium, instead of half way down the thigh as in a normal individual. The trunk was well-formed and there was no lordosis. The abdomen was prominent. There was no beading of the ribs.

The total height of the body was thirty inches, as compared with thirty-seven in a normal child of the same age. The head was distinctly hydrocephalic, measuring twenty-three inches in circumference, as compared with twenty-two in a normal child of the same age. As the head was larger than normal, also, in a vertical direction, it will be seen that the defective height of body was due to the shortening of the femora. The body otherwise was plump and robust. The anterior fontanelle was open, and the enlargement of the head was very noticeable posteriorly. The nose was broad, the root retracted. The mouth was broad and the child was apt to protrude the tongue. Dentition was very imperfect, and most of the teeth were decayed away.

The fingers were plump, somewhat pointed at their extremities; the second, third, and fourth fingers were almost of the same length, and the hand showed the characteristic "trident" deformity.

It is worthy of note that the second and third toes of the left foot were partially webbed.

The mentality of the child was fair, though it was stated that he was slower in walking and talking than the other members of the family.

Skiagrams showed that the femora and humeri were considerably shortened, and also somewhat curved, and that the ends of the long bones were distinctly enlarged. So far as I could tell, there was no ingrowth of the periosteum between the epiphyseal discs and the cartilages.

As bearing on the possible etiology, it was interesting to learn that the first child of the family presented spina bifida: also, one maternal uncle was somewhat dwarfed, and another had the second and third toes of the left foot webbed. There was, however, no other similar case in the family, or among the forebears, according to the information of the parents.

We have, therefore, in this case a very typical example of chondrodystrophia fœtalis, of the subvariety called by Kaufmann Chondrodystrophia hyperplastica. It is worthy of note that lordosis is absent, and the disturbance of development is confined to the limbs and head. Consequently, we are not dealing with primary or "essential" dwarfism, but with a symptomatic form, for the former involves the body as a whole.

If symptomatic, of what is it symptomatic? Is it rickets? While there may, in some cases, be a superficial resemblance between the two conditions, careful study will show some important and characteristic differences. The dwarfism in chondrodystrophia is micromelic: not so in rickets. Periosteal bone formation is not interfered with in chondrodystrophia while it is in rickets. Basilar synostosis does not occur in rickets, nor do you get the "trident" deformity of the hands. Moreover, developmental anomalies, such as cleft palate, polydactyly, and syndactyly, do not occur in rickets. In healed rickets, the bones affected are abnormally dense, while in many cases of chondrodystrophia they are normal in consistence, though possibly somewhat vascular, while in some they are soft. This last point would seem to negative the conclusion that chondrodystrophia is rickets that has run its course during intrauterine existence.

Is it cretinism? This is more difficult to decide. There is a certain amount of evidence to show that Kaufmann's "cretinoid" type of chondrodystrophia may be regarded as cretinism of intrauterine incidence. This evidence may be stated as follows:

Virchow¹ found in the Canton of Glarus, Switzerland, where goitrous cretinism is endemic, not a few cases of chondrodystrophic dwarfism, without the gross manifestations of cretinism. Microscopical investigation of the growing ends of the bones show that in cretinism and chondrodystrophia there is a striking similarity. In both we have small stature, a peculiar facial configuration, feeble mental powers, with sundry minor points of resemblance. Hofmeister² found that the lesions in the bones, produced by thyroidectomizing rabbits, were identical with those described by Kaufmann, H. Müller, Kirchberg, and Marchand as occurring in chondrodystrophia. Leblanc³ and Nasan⁴ state that chondrodystrophia is often associated with myxoedema. In twelve cases of the cretinoid type, culled from

¹ Virchow's Archiv. XCIV, 1883.

² Beiträge zur klin. Chirurgie, 1894.

³ Comptes rendus de Soc. de Biologie, book 88-89, 1902.

⁴ Rêvue de Neurologie, 1901, p. 549.

the literature, the thyroid gland was found to be grossly altered, usually absent or atrophied: in one case hypertrophied. In the non-cretinoid cases the thyroid was unaltered, so far as one could judge.

Opposed to these considerations, it has been advanced that the distribution of the lesions in chondrodystrophia indicates that this affection originates from the third to the sixth week of intrauterine existence, at which time the thyroid is not properly formed. And, again, that thyroid feeding has not proved beneficial in these cases. This latter argument, however, fails to carry much weight if we hold that in chondrodystrophia we are dealing with a completed pathological process, completed, that is to say, *in utero*. Specific medication could not, therefore, be expected to produce any effect. So far as one can judge, without more extended information, it seems likely that the cretinoid type of chondrodystrophia is really "fœtal cretinism," while the other forms are not. In our own case, described above, there is little to identify it with cretinism, unless possibly the retracted nose, the large head, wide mouth, and defective dentition, yet in my judgment these are not important enough to bear this interpretation.

We may pass on now to the consideration of two other factors which have an undoubted bearing on the question of dwarfism of this type, viz., heredity, and intrauterine pressure.

The influence of heredity generally, in perpetuating anatomical and other familial peculiarities is too well recognized to need enlarging upon here. Polydactylism may be cited as a case in point. It is, however, a curious and striking fact that some of these heritable conditions have been found to be associated with chondrodystrophia. Thus, Bowlby¹ reports a case with cleft palate, a deformed nose, and polydactylism of the feet. In our own case, syndactylism in one foot was exactly paralleled in the person of a maternal uncle. Theodore Kerckring in a work entitled, "*Spicilegium Anatomicum*," published in 1670, figures a micromelic dwarf in whom there was polydactylism of both hands and both feet. Porak² records a case in which a dwarf gave birth to one healthy child and another presenting all the features of so-called "fœtal rickets."

Guéniot³ recounts the operation of Cæsarian section on an achondroplastic dwarf, the child being similarly affected. Clearly, heredity may on occasion play an important role. Yet, on the other

¹ Trans. Pathological Society, 1884, p. 450.

² Beitrag zur Histologie u. Funktion der Schilddrüse, Inaug. Diss., Königsberg, 1892.

³ Bull. et Mém. de la Soc. Obstetr. et Gynécol. de Paris, Jan., 1893.

hand, the parents of achondroplastics may be perfectly formed, and their children may be normal.

Intrauterine pressure is, also, as clearly associated with anomalies of development. Klebs¹ records a remarkable case of this kind. In an ectopic gestation the fœtus was found in a tight sac within the transverse mesocolon. There was syndactylism in the upper extremities and polydactylism in the lower. From a study of the recorded cases it would appear that contraction of the amniotic sac does not lead to stunting of the body as a whole, but that certain parts such, as the extremities and head are more apt to be affected. It is suggestive that in our case, there was probably hydramnios in the mother, and one of her former children died with spina bifida shortly after birth. It is known that hydramnios is not infrequently associated with grave deformities, among which may be mentioned exencephaly, spina bifida, and osteogenesis imperfecta, this last-mentioned condition being found also, though rarely, with chondrodystrophia. In this connection it may be mentioned that in Klebs' "General Pathology" there is an illustration representing a microscopical section through the growing end of one of the long bones of a micromelic dwarf. The cartilage cells here are closely packed and flattened with their long axes at right angles to the long axis of the bone, an appearance that could hardly be attributed to anything else but pressure.

In the case cited in this paper, it is difficult to attribute the striking anomaly of development to intrauterine pressure, to the exclusion of hereditary influences. The syndactyly was clearly a Mendelian character. Nor, indeed, is it necessary to exclude either factor. For even if we conclude that the condition was due to intrauterine pressure, the result of hydramnios, the tendency to hydramnios itself may have been handed down from some ancestor. On the whole, the view of Virchow seems to be more in keeping with the facts as we know them. This great pathologist pointed out that the condition of chondrodystrophia gradually shades into a more pronounced developmental anomaly, which is finally represented by the phocomelia of Saint Hilaire. He objects to the term chondrodystrophia, introduced by Kaufmann, on the ground that the obvious errors in development that are sometimes associated with this condition can only be explained on the basis of some peculiarities of the "Anlage."

¹ Textbook, p. 306.

*Ganoid Fishes from near Banff, Alberta.*¹

By LAWRENCE M. LAMBE, F.R.S.C., F.G.S.A.,

Vertebrate Palæontologist to the Geological Survey, Canada.

(Read May Meeting, 1916.)

During the summer of 1915 remains of fishes and invertebrates were obtained by Geological Survey parties at two localities, about two miles apart, west of Banff, in rocks that have been regarded as of Jurassic age and coloured as such on the map.²

The fish remains represent three apparently undescribed species belonging to three distinct genera all of which have a considerable range in geological time. The fishes, therefore, in this particular case, throw little light on the exact age of the beds in question. From the invertebrates, however, more definite information is fortunately obtainable as they have been recognized as belonging to a fauna already known as distinctive of a lower Triassic horizon in the Rocky Mountains region of the United States. It appears necessary therefore to regard the beds from which the above fossils were collected as most probably of lower Triassic rather than of Jurassic age.

At the first of the above two localities, a railway cutting on the line of the Canadian Pacific railway a few hundred yards west of Massive (a station 13 miles west of Banff), Mr. L. D. Burling, of the Geological Survey, collected fish remains representing two species, with lamellibranchs, lingulæ, etc. At the second locality, two miles east of Castle Mountain railway station, on the trail to Johnson creek, at a point about two miles north of the forest ranger's cabin, Mr. J. A. McLennan, field assistant to Dr. E. M. Kindle, of the Geological Survey, obtained a specimen of a third species of fish and some invertebrates.

The fish bearing layers from both of these localities are of a very fine, dark grey, calcareous sandstone, with a brownish tinge on weathered surfaces. The beds exposed in the railway cutting at Massive have been referred to by Professor John A. Allan (Guide Book, No. 8, p. 191), as composed of shales of Jurassic age (Ferne shales). It would appear, therefore, that with these shales occur

¹ Communicated with the permission of the Deputy Minister of Mines.

² Guide Book, No. 8 (one of the series issued by the Geol. Survey of Canada on the occasion of the visit of the International Geological Congress to Canada in 1912), Part II, p. 191, route map between Banff and Golden.

interbedded the thin layers of calcareous sandstone in which the fish remains are found. The shales exposed at Massive extend a few miles northward toward Johnson creek and it is in their northern extension that Mr. McLennan obtained his specimens at the second locality.

The very large species of *Platysomus* which I described in 1914 in the Transactions of the Royal Society of Canada, is preserved in a rock lithologically identical with that of the above two localities and differing only in having the brown tinge of the dark grey colour less accentuated. E. W. Peyto, of Banff, the discoverer of the type of *Platysomus canadensis*, Lambe, did not reveal the exact place where his specimen was found but it is understood to be near Johnson creek and is in all likelihood from the set of beds outcropping at Massive and on the Johnston Creek trail. In the paper descriptive of *Platysomus* the beds from which the specimen came were referred to as presumably of Permian age.

The genera represented in the 1915 collections are—*Cœlacanthus*, *Elonichthys* and *Acrolepis*.

The Crossopterygian family Cœlacanthidae ranges from the Devonian to the upper Cretaceous. The type genus *Cœlacanthus* is found on both sides of the Atlantic in the Carboniferous and Permian and is best known in North America from the Coal Measures of Ohio, U.S.A. The Actinopterygian genera *Elonichthys* and *Acrolepis*, of the family Palæoniscidae, include Carboniferous and Permian forms. The discovery, therefore, of species belonging to the above three genera in rocks of lower Triassic age extends their known upward range, if the generic relations of the specimens collected by Mr. Burling and Mr. McLennan are correctly interpreted. If in this small but interesting fish fauna we include *Platysomus canadensis* as belonging to this horizon, we also extend the range of *Platysomus* upward from the upper Permian, the highest horizon at which *Platysomus* has hitherto been known to occur.

In this paper descriptions with figures are given of the specimens collected in 1915. The generic determinations are tentative only. In the case of the specimen referred to *Elonichthys*, although the sum of the characters displayed point to that genus as the one to which the species probably belongs, the absence of such important parts as the head and tail makes an exact determination difficult. The great size of the pectoral fin is a very marked feature of this fish and in no described species with the suggested generic affinities of this one is so large a pectoral fin present. The species is described as new. In the case of the specimens referred to *Cœlacanthus* and *Acrolepis* more comprehensive material is most desirable and may

be forthcoming with further collecting. The two species represented are provisionally described as new.

The species from the Massive beds and their extension northward toward Johnson creek, constituting a fish fauna of considerable interest, are as follows:

Cœlacanthus banffensis, sp. nov.

Elonichthys cupidineus, sp. nov.

Acrolepis lætus, sp. nov.

Platysomus canadensis, Lambe.

Dr. E. M. Kindle, Invertebrate Palæontologist of the Geological Survey, has kindly furnished me with the following note as to the probable Lower Triassic age of the fish bearing beds, at and near Massive, on the evidence of their invertebrate fossils:

"The following memoranda relate to the invertebrate fossils associated with two small lots of fossil fish collected during the season of 1915 in the Rocky Mts. near Banff, Alberta. The fossils were obtained from two localities respectively 13 and 15 miles northwest of Banff and designated as station 235 in Mr. Burling's field notes and station 10 in my notes. Mr. Burling's station is in the cut at Massive siding on the Canadian Pacific railway while my station is 3 miles northwest of Massive on the left of the trail crossing the ridge to Johnson's creek. The rocks at both localities are dark grey, hard, sandy shale where unweathered, with varying amounts of lime in different strata. They weather to various shades of brownish or buff grey. The two localities represented by these specimens furnished in addition to the vertebrate fossils numerous specimens of invertebrates including a species of Lingula, various species of pelecypods and ammonites. These beds have been assigned to the Jurassic by Dr. J. A. Allan.¹ The fossils collected from them, however, clearly represent the same fauna which I have collected from the Upper Banff shale west of the Bow River falls at Banff. I therefore consider these beds to belong to the Upper Banff shales instead of the Fernie as they have been mapped.

"The Upper Banff shale has been referred in some of the recent reports of this Survey to the Permian. Since the original reference of the Upper Banff shale to the Permian was of a provisional character it has seemed desirable to re-examine the question of the age of these beds in the light of the additional evidence of the last season's collections. I have accordingly brought together all of the available collections from these beds including Prof. Shimer's collection from

¹ Int. Geol. Cong. Guide Book 8, pt. 2, p. 191.

the L. Minnewanka section and referred them to Dr. Geo. H. Girty of the United States Geological Survey who has a wide acquaintance with the faunas of this and related horizons in the Rocky Mts. of the United States. Dr. Girty concludes that these faunas represent the horizon of the Lower Triassic (Meekoceras beds) of Idaho, Utah, and Wyoming. If this opinion is correct, as I believe it to be, the reputed Jurassic beds from which the fossil fish transmitted to you were obtained and the 'Permian' of the Banff map¹ as well should be referred to the Triassic. Inasmuch as most of the species in this fauna are new this determination will have to rest for the present on evidence of a somewhat general character."

DESCRIPTION OF SPECIES

Cœlacanthus banffensis, sp. nov. Plate I.

This species is represented in Mr. Burling's collection of 1915 from near Banff, by a pectoral fin, plate I, figure 1, of large size, and numerous cycloid scales preserved together on the same rock surface (Cat. Nos. 756, 756a).

Judging from the characters displayed by the fin in conjunction with those of the scales the fish is thought to belong to the genus *Cœlacanthus* of Agassiz. The preservation of the fin is good and the structural characters seen in it and the scales are sufficiently diagnostic to convince one of the Cœlacanthid affinities of the fish represented as well as of its probable proper reference to the genus *Cœlacanthus* yet the limited amount of material at present available renders it expedient to make a more positive reference to this particular genus dependent on the confirmatory evidence of more comprehensive specimens from the same general locality. The above name proposed for the species is also regarded as provisional.

The fin is 102 mm. (4 inches) long and 38 mm. ($1\frac{1}{2}$ inches) in maximum breadth, and consists of a basal lobe with about twenty-four articulated, non-bifurcating rays proceeding therefrom. In outline it is roughly triangular with a short base and long convex sides.

The lobe of the fin is narrow, rounded in outline distally, and protrudes into the fin over one-quarter of the latter's length. It occurs in the fossil as a vacant space at the base of the fin, and although scales are indistinctly seen in this area they may not be in place. The greater number of rays and the longest ones proceed from the anterior margin of the lobe. On the posterior side the rays are short and comparatively few.

The rays are stout, broadest at mid-length whence they narrow gradually to the distal end, without bifurcation. The long, principal

¹ Locality cited.

rays in the more anterior part of the fin have a breadth of about 1.5 mm. at mid-length. Throughout, from near the lobe, they are closely articulated, five or six divisions occurring in a space of about 4 mm., plate I, figures 2 and 3.

Many scales are indicated in the same plane of cleavage with the fin. They have a rough outer surface and are broadly oval in outline but somewhat pointed or narrowly rounded posteriorly. In none of them has the anterior margin been seen which leads to the belief that most of them are not much disturbed from their proper overlapping position, a belief strengthened by the fact that their posterior margins all point the same way or nearly so.

The scale sculpture or ornamentation consists of many short, discontinuous enamelled ridges, having a general antero-posterior direction, but with an irregularly disposed appearance and showing a tendency to become squamous. These ridges may also be described as having the appearance of low-lying spine bases or very short spines pressed close to the scales surface, plate I, figure 4. The presence of many of the scales is indicated only by a slight convexity covered with this style of ornamentation. The scales vary in breadth from about 8 to 10 mm., and are longer than broad.

Elonichthys cupidineus, sp. nov. Plate II.

The single specimen (Cat. Nos. 757, 757a.) on which this species is founded comes from the railway cutting at Massive and was also collected by Mr. Burling in 1915. It is in a sufficiently good state of preservation to show minute details of structure, and includes the lower hinder part of the head, and the trunk to near the base of the tail, with the pectoral, pelvic, anal and dorsal fins. The specimen has been freshly broken along a line running obliquely downward and forward from the anterior end of the dorsal fin to a point a short distance in advance of the base of the pectoral fin, and what was above this line, viz., most of the head and a large part of the back, is missing. Weathered fractures show that the lower front margin of the pectoral fin, and the tail with the distal part of the dorsal fin had probably been separated from the specimen, as it now is, for some time.

The characters revealed indicate a species referable if not to *Elonichthys* to a probably allied genus which may prove to be undescribed. The trunk is rather deeply fusiform but no doubt the depth is increased to some extent by pressure. Fulcra are present in the fins, at least in the pectoral and pelvic pairs. The rays of the pectoral, pelvic and anal fins subdivide and are articulated. The base of the pectoral and pelvic fins is short, that of the anal and dorsal ones long. The anterior end of the base of the dorsal fin is apparently

not in advance of that of the anal. The scales are rhomboidal and rhombic, strong, only slightly over-lapping, enamelled, and sculptured with faint, oblique ridges in their hinder half. The articulating pegs and sockets are well developed.

The most striking feature in this fish is the very large pectoral fin which, so far as the writer is aware, greatly exceeds in proportionate size that of any other described Palæoniscid species. The dorsal instead of being opposite the space between the pelvic and anal fins, as is usual in the genus *Elonichthys*, is farther back, in line with the anal. The pelvic fins are small, in marked contrast with the large pectorals and are midway between the pectorals and the anal.

This specimen, plate II, figure 1, the type of the species, is 230 mm. long, and 98 mm. deep across the trunk at the anterior end of the dorsal and anal fins, representing a fish which was probably about 370 mm. (roughly $26\frac{1}{2}$ inches) long, if the restored dotted outline shown in the figure is moderately correct. In the same figure the full length of the pelvic, anal and dorsal fins is estimated from the strength of the rays where they are broken off (dorsal and anal fins) or have become too slender to leave a lasting impression in the rock (pelvic fin). The right pectoral fin protrudes below the trunk, in the space between the pelvic and left pectoral fins, in a confusion of scattered rays mixed with long strips in which the rays have retained their proper relative positions. The depth of the fish in life was probably considerably less than is indicated by the specimen.

Above the base of the pectoral fin is seen in a general way the hinder curve of the opercular apparatus the elements of which, however, are not sufficiently defined for determination. The deep groove here probably indicates the position of the clavicle and at its lower end, directed forward and upward, are indistinct broken outlines suggestive of three or four branchiostegal rays. Outer surfaces of bone in this part of the specimen are ornamented with a combination of minute shallow depressions and short squamous grooves.

The pectoral fin has the outline of a short, broad paddle and is remarkable for its great size. Its base is short and from it spring about thirteen stout, smooth rays which bifurcate at a distance of 20 mm. from the base. The ray-subdivisions, by four further bisections at lengthening intervals, increase in number and slenderness distally, plate II, figures 2 and 3. Apparently the articulation of the rays does not begin until after the first bisection. The first anterior ray is short, the second is longer, and both seem to be simple or undivided but articulated distally.

The pelvic fin has jointed rays of a tenuity in keeping with its small size. In this pair of fins the base is short and the distal end appears to have been rounded in outline.

In both the dorsal and anal fins the rays are stout proximally and well spaced. In the anal fin they bifurcate a short distance from the base and are jointed, but in the dorsal one evidence of both these features is wanting. In both fins the base is long and the shape seems to have been somewhat triangular. A greater length of the rays is preserved in the anal than in the dorsal fin and for this reason the triangular outline of the former can be spoken of with greater assurance; in both the full length of the rays is suggested only by their size where they are broken off in the specimen. A series of short fin-supports is present along the base of both these fins. As these endoskeletal elements lack clear definition it is difficult to ascertain whether they correspond in number or not with the dermal fin-rays they support.

The anterior end of the row of dorsal fin-supports is thought to be seen in the specimen, indicating that the dorsal was of nearly the same size as the anal fin and did not extend far forward on the back as for instance in the Carboniferous genus *Eurynotus* of Britain and Belgium.

Fulcra are present in the pectoral and pelvic fins, small and delicate in the latter, larger and more robust in the former. Whether they occur in the anal and dorsal fins is not known as the anterior border of these fins is not present in the specimen.

The scales of the upper part of the flank toward the front are the largest and are much higher than long. In the exposed surface of these scales the height to length is in the proportion of about 4 to 6.5, plate II, figure 4. In passing downward and backward in the fish there is a gradual diminution in scale-height with a retention of about the same length throughout to near the tail. The anterior ventral scales are the smallest, with a minimum of height; they are three times as long as high, plate II, figure 5. The scales of the mid-length of the flank have their height and length about equal, plate II, figure 6. Those nearer the tail, in the area between the dorsal and anal fins, are nearly twice as long as high, plate II, figure 8. Throughout, the overlap of the scales is slight; with the reduction in their height there is a corresponding diminution in the size of the articulating peg.

The hinder part of the outer scale-surface is ornamented with fine ridges, about ten in a space of 3 mm. directed obliquely downward and backward, and delicately notching the back edge of the scale. The style of ornamentation and the size of the ridges remain the same

in all the scales irrespective of their size. In many of the scales, more particularly in those well forward, growth lines are noticed near and parallel with the lower margin.

For the species above described the name *cupidineus* is here proposed. As regards the present reference of this species to the genus *Elonichthys* it may be stated that the remote position of the dorsal fin, directly opposite the anal fin, is not fully in accord with its generally understood location in that genus. Other characters, such as the small size of the pelvic fin, the broadness of the pectoral distally, and the absence of sculpture on the principle fin-rays are also in disagreement with *Elonichthys*. Until, however, the head, tail and dorsal fin of this Banff fish are known, or at least some diagnostic characters supplementing those of the fins and scales, a provisional generic reference only is possible. Some knowledge of the dentition is particularly desirable.

*Measurements of Type Specimen of
Elonichthys cupidineus*

	. mm.
Length of pectoral fin, slightly over 5 inches, about.....	130
Greatest breadth at midlength of same, estimated.....	60
Length of pelvic fin near anterior border, estimated.....	28
Length of anal fin near anterior border, estimated.....	48
Length of dorsal fin near anterior border, estimated.....	42
Length of base of pectoral fin, about.....	15
Length of base of anal fin, about.....	35
Length of base of dorsal fin, about.....	35
Breadth of pectoral fin rays (3rd, 4th, 5th, 6th and 7th) above their first subdivision, each.....	1·5
In 5th pectoral ray, about midlength of fin, six joints in.....	11
Fulcra of pectoral fin, about seven in.....	13
Fulcra of pelvic fin, about seven in.....	7
Upper anterior flank scales, height.....	9
Upper anterior flank scales, length (fore and aft).....	3·75
Lower anterior flank scales, height.....	4·2
Anterior abdominal scales, height.....	1·4
Lower flank scales, in line with pelvic fin, height.....	2·5
Lower flank scales, in line with anal fin, height.....	2·3
Length of fin-supports near front of dorsal fin, about.....	10

Acrolepis latus, sp. nov. Plate III.

A species of small size, with scales rugosely sculptured, is represented by an imperfect trunk, Cat. Nos. 755, 755a. In this specimen,

plate III, figure 1, which measures $2\frac{3}{4}$ inches in length and slightly over an inch in maximum depth, the fins are not preserved, and the head and tail are wanting. The scales, however, are in place and are well preserved showing details of sculpture. The specimen was collected on the 21st of July, 1915, by Mr. J. A. McLennan, field assistant to Dr. E. M. Kindle, on the trail to Johnson creek, at a point about two miles east of Castle Mountain station.

The rock in which the specimen occurs is a very fine, calcareous sandstone having a dark grey colour in a fresh fracture but decidedly brownish when weathered. The specimen as it now is, is partly on one and partly on the other of the two surfaces produced by splitting the rock along the plane in which the specimen lies. The greater part of the upper half of the trunk has adhered to one of the rock surfaces, the larger of the two (Cat. No. 755) exposing the outer side of the upper right scales from far forward on the flank to near the tail. Here the entire irregular outline of the specimen is seen, as well as clear impressions in the rock of the outer surface of the lower scales of the left side of the trunk. Most of the lower half of the trunk has come away on the other cleavage surface of the rock (Cat. No. 755a) exposing to view the outer surface of the lower scales of the left side, the scales of which the impressions, just mentioned, are so clearly preserved.

This fish was a small one, probably about 6 inches in length or less. As the head is missing and the tail and fins are not preserved it is necessary to rely entirely for its generic determination on the characters supplied by the scales, plate III, figures 2, 3 and 4. Fortunately these scales are well preserved; their outer sculptured surface is seen to advantage throughout the greater part of the trunk, while a few scattered scales give full information regarding the inner surface. What appear to be two or three fragments of fin rays occur with the scattered scales but they are rather obscurely preserved and fail to give details of structure.

The combination of characters displayed by the scales suggest the propriety of referring this fish to the Palæoniscid genus *Acrolepis* of Agassiz. For the species the provisional name *latus* is proposed pending the discovery of more complete material.

The scales are small with a well developed peg and socket articulation and a considerable overlap which, in the anterior flank scales, is slightly over $1/5$ of the length (antero-posterior) of the scale. Anteriorly on the flank the exposed or sculptured part of the scales, which is lozenge shaped, is somewhat higher than long. Following backward toward the tail the scales decrease slightly in size and also in proportionate height. A decrease in height is also noticed in the

scales near the dorsal and ventral midline. The scales of the midline of the back are not preserved in the specimen.

The sculpture of the scales, which gives them a decidedly rough or rugose appearance, consists of from about five to seven broadly rounded ridges running obliquely backward and downward on the scale with a general appearance, accentuated in some of the scales, of convergence toward the postero-inferior angle of the scale. The ridges bend upward anteriorly and downward posteriorly (figures 2 and 3). They are not of equal breadth and often the larger ridges are divided longitudinally by a shallow groove for the whole or, more frequently, part of their length so as to assume the appearance of bifurcating forward or backward according as to whether the ridge is shallowly grooved anteriorly or posteriorly. On the ridges are also observed at intervals along their length a number of inconspicuous nodes or transverse swellings which help to accentuate the roughness of the scale sculpture. The ridges end posteriorly as denticulations of the scale margin.

The few scattered scales, already mentioned as preserved in the rock just outside the limits of the trunk, display the smooth inner surface with a well defined socket in the lower half at the midlength of the scale and a peg arising from the middle of the upper margin, figure 4. In these scales, which appear to be anterior flank ones, the entire outline is visible, showing that the front edge is straight and that the upper front angle is produced upward to about half the height of the peg. The denticulations along the posterior margin are conspicuous and antero-inferiorly the edge is broadly rounded.

All the drawings illustrating the above descriptions, and reproduced in the accompanying plates, have been made by Mr. Arthur Miles.

PLATE I

Figure 1. Pectoral fin, type of *Cœlacanthus banffensis*; natural size.

Figure 2. One of the principal fin-rays showing the general shape and close articulation; twice the natural size.

Figure 3. A few of the articulated joints of the same; four times the natural size.

Figure 4. Cycloid scales, preserved with the fin, showing the ornamentation of the outer surface; twice the natural size. The particular scales figured are those shown at *a* in figure 1.



PLATE II

- Figure 1. General shape of the skull; twice the natural size.
- Figure 2. Subdivision and articulation; natural size.
- Figure 3. Joints of the same as in Figure 2; twice the natural size.
- Figure 4. (Outer surface of upper and lower jaw bones; twice the natural size.)
- Figure 5. General shape, sculpture, etc.; twice the natural size.
- Figure 6. Outer surface of left and right mandibles; twice the natural size.
- Figure 7. Outer surface of scales; twice the natural size.
- Figure 8. Outer surface of scales; twice the natural size.
- Figure 9. Outer surface of scales; twice the natural size.

PLATE II

Figure 1. Left lateral aspect of the type of *Elonichthys cupidineus*; one-half the natural size.

Figure 2. One of the rays, from near the middle of the pectoral fin, to show its subdivision and articulation; natural size.

Figure 3. Joints of the same at *a* in figure 2; twice the natural size.

Figure 4. Outer surface of upper anterior flank scales of the left side to show their general shape, sculpture, etc.; twice the natural size.

Figure 5. Outer surface of left anterior ventral scales; twice the natural size.

Figure 6. Outer surface of scales from the midlength of the left flank; twice the natural size.

Figure 7. Inner surface of an upper posterior scale of the right side; twice the natural size.

Figure 8. Outer surface of scales of right side from near caudal peduncle; twice the natural size. Drawn from the natural impression of the scales.



PLATE III

Figure 1. *Chelodactylus* (upper right) and *Chelodactylus* (lower left) in natural size.

Figure 2. *Chelodactylus* (upper right) and *Chelodactylus* (lower left) in natural size. The sculpture of the upper right is enlarged eight times.

Figure 3. Outer surface of scale from the same part of the fish; enlarged eight times. To show the minute nodules on the ridges they raised the scale from front to back it was found necessary to slightly emphasize them in the drawing.

Figure 4. Outer surface of scale of *Chelodactylus* (lower left) in natural size. This is the same as in figure 1.

PLATE III

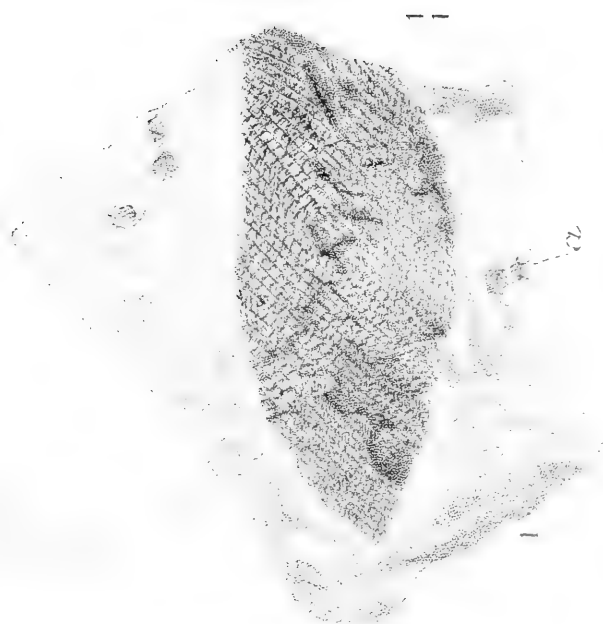
Figure 1. *Acrolepis latus*, type specimen, right lateral aspect; natural size.

Figure 2. Outer surface of upper flank scales of right side, toward the front, to show the general shape and the rugose sculpture; enlarged six times.

Figure 3. Outer surface of scale from the same part of the fish; enlarged eight times. To show the minute nodes on the ridges traversing the scale from front to back it was found necessary to slightly emphasize them in the drawing.

Figure 4. Inner surface of scale of left side; four times the natural size. This scale is separate from, and lies beneath, the specimen at *a* in figure 1.

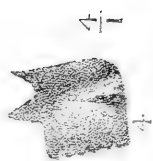
PLATE III



3



4



5

Transactions of The Royal Society of Canada

SECTION IV

SERIES III

SEPTEMBER 1916

VOL. X

Notes on Cambrian Faunas, No. 12

By G. F. MATTHEW, LL.D., D.Sc.

(Read May Meeting, 1916)

In previous volumes of the Proceedings and Transactions of this Society the writer, under the above heading, has described various forms of Cambrian animals, and proposes in this article to offer some remarks on the Physics and Ecology of the Cambrian rocks in Eastern Canada.

On the relation of the Cambrian faunas in Eastern Canada to the aspect of the Earth's surface in that region.

In the remarks that follow I shall confine myself chiefly to what was known to English geologists as "Lower Cambrian" and which in this region as in England is separated from the Upper Cambrian by a great mass of coarse measures, there known as the "Lingula flags,"—measures which both there and in Eastern Canada are marked chiefly by the presence of the genus *Lingulella*. So great is this mass in the St. John basin of Cambrian rocks that it equals in bulk all the other Cambrian sediments there. Nevertheless it allows of a fairly full representation of the Cambrian faunas in the underlying and overlying beds as will be seen by the accompanying table.

*CONSPECTUS OF THE CAMBRIAN ROCKS IN NEW BRUNSWICK,
CANADA.*

Approximate thickness in feet	Kind of sediment, &c.	Genera of Tribolites, &c.	Local classification		Classification	
					Salter and Hicks	Walcott
700 feet	Dark gray shale, &c.	Dichograptus Tetragraptus	Div. 3. Bretonian	St. John group	Lower Silurian (part of)	Lower Ordovician
	Black shale or slate	Dictyonema Clonograptus Bryograptus			Upper Cambrian	Upper Cambrian
	Dark gray shale or slate Some sandy and calcareous layers	Sphærophthalmus Ctenopyge Leptoplastus Peltura Parabolina				
1000 feet	Gray flags and sandstones coarse gray slate	Lingulella, &c.	Div. 2. Johanian		Middle Cambrian	
200 feet	Gray shale or slate	Solenopleura Liostracus Conocoryphe Paradoxides Microdiscus	Div. 1. Acadian		Lower Cambrian	Middle Cambrian
50 feet	Greenish gray shale, gray sandstone at the base	Agraulos Protolenus				
1200* feet	Red slates and Sandstone	Obolus Hyalolithes	Etcheminian	Basal Cambrian		Lower Cambrian
2000* feet	Volcanic ash and breccia, felsites and diorites	No fossils in New Brunswick	Coldbrookian			

* At Hanford Brook, St. Martin's.

To avoid confusion in the use of terms the writer has inserted in the sixth column of the accompanying table the larger divisions of the Cambrian System as they have been used in England, and shown how they compare with the Acadian names (in the fourth and fifth columns) and with the divisions and arrangement lately used in America.

The first three columns are intended to show in a general way the approximate thickness of the Cambrian measures in the St. John district, the composition of these measures and the genera of trilobites, &c., which characterize the several parts of the Cambrian system as here displayed.

It is surprising to see how few and how far apart are the districts in eastern North America where the Cambrian rocks have been recognized by determinable fossils, and where such Cambrian age can be determined without any reasonable doubt. These districts are six: four on the Atlantic coast and two in the interior. By their fauna these districts naturally fall into two groups separated by the distinctness of their species and evidently belonging to two separate zoological provinces. By the genera they have yielded those of the two interior districts are clearly allied to the Cambrian types of western North America, and whether we attribute resemblance to a uniformity of temperature of the Cambrian seas in that region, or to other causes, the faunal grouping of the two interior districts is with those of the Rocky Mountains, or even distant China, they clearly had a different biological history from the other eastern exposures. As regards the faunas contained in the Cambrian rocks along the Atlantic coast, especially in the Paradoxides Zone, many close links of relationship are noticeable in the fossils with those of Europe; and this may be traced from the Baltic Sea to Massachusetts Bay on the coast of New England, as though a similarity of temperature or connection shallows of the ocean had prevailed for the whole width of the Atlantic ocean at some part of its extent.

The Cambrian basins of the St. John district.

The area which we have alluded to above as one of the four districts of the Atlantic coast, is that which forms the strata &c., described in the preceding table, and is the basis of the following remarks. The district shows three basins of which the southernmost exhibits the full series of Cambrian rocks, which in the other basins are curtailed by transgression or erosion. The transgression, which is accompanied by evidences of a slight discordance (conglomerates, &c.) is indicated on the table by a double cross-line, for at this point in the

middle basin, the "Basal" Cambrian deposits are wanting, and it is assumed that this area was above the sea when the Basal beds were being deposited in the southern and in the northern basin ("Long Reach").

These deposits have volcanic rocks at the bottom, and at some places where the contact of these volcanic rocks with the underlying complex can be seen, the surface of the older rocks has been weathered and softened before the deposition of the volcanics, as though the ridge of older rocks had been above the sea before the former had been deposited upon it.

For this reason and others, it is also thought that the southern basin was in part at least, above the sea at the time that the felsites etc., which border it, were extruded. For the basin was walled in on both sides by ridges of these volcanic rocks parallel to each other on opposite sides of the valley in which the basin lies, one ridge known as the Quaco hills separating it from the Bay of Fundy, and the other called the Loch Lomond hills bordering it on the North side.

On the inner slopes of these volcanic ridges, and between them and the gray strata of the St. John group, lie the red sandstones and slates that compose the Etcheminian strata in which organic remains are rare, the most distinct being poorly preserved Brachiopods and Hyolithids. Yet these form the first water-washed deposits of the Cambrian series and are of special interest on that account. At the western end of the basin one sees but little foreign matter, where the lowest of the red beds come in contact with the underlying deposits; but at the eastern end the fragmentary rocks at the contact contain rounded pebbles of quartz, showing derivation from some other source than the volcanics whose fragment forms the principal mass of the basal conglomerate. Thus, tho' there is a break at this point, it is not a very obvious one.

The few fossils found in the red rocks give but little promise of the wealth of forms that appear in the grey mud beds of this basin, at a later time, in the Cambrian fauna of the Paradoxides Zone, so largely exhibited in the numerous species at St. John, or even in the less prolific *Protolenus* Zone below them.

The Protolenus Fauna.

The *Protolenus* shale beds are based on a fine-grained gray sand stone which is spread all over the St. John basin. Unweathered it is of a pale greenish gray color, but it weathers almost white, and thus becomes a conspicuous land-mark at this horizon; it appears to be the basal member of the St. John group in this basin.

The *Protolenus* fauna was so named from the presence in it of two species of the genus *Protolenus* occurring at different horizons in this zone; of these *P. elegans*, W. D. Matthew, is by far the most abundant, and also most widely distributed vertically, and with other genera of trilobites, Ostracods, &c., give character to the fauna. The exact reference of the several species to their special layers, is due to the careful work of Messrs. W. D. Matthew and Gilbert van Ingen, students in the School of Mines of Columbia University, when a study of the Cambrian measures of this fauna was undertaken. One condition of preservation of the organic remains of this zone was, that many of the fossils were preserved in or attached to nodules of phosphate of lime in the shaly layers, and thus had their exact form preserved; and were not flattened, nor distorted, as are many of the fossils found in the mud beds of the Cambrian system. The Swedes who have studied the occurrence of phosphate nodules in the Cambrian strata of their own country have offered the opinion that this compound has been derived from the decay of organic forms which have this substance in their tests, and that the deposit of this mineral only occurs where the water is comparatively clear, and the sea shallow. The nodules have been found only at the eastern end of the St. John basin of Cambrian rocks; tho' the typical forms of trilobites of this zone, have been met with at both ends of the basin and in the next basin to the north; but the fossils of the eastern end of the St. John basin, were chiefly depended on for the determination of the species.

In extending the study of the Cambrian rocks of the Maritime provinces of Canada to Nova Scotia, it was found that in the island of Cape Breton the volcanic rocks (felsites, &c.) which underlie the stratified rocks in that island contained, at Dougald brook, shaly layers holding Brachiopods and Ostracods of Cambrian type, and of genera, most of which could be duplicated in other areas of Cambrian rocks, it was therefore thought that these rocks should be referred to the Cambrian system. There was however, on this brook, one peculiar genus of Brachiopods which has not been found elsewhere in the Cambrian rocks. Hence tho' there was no proof, by fossils, that the great mass of volcanic rocks at the base of the Cambrian (the Coldbrook) were of Cambrian age it seemed proper to include them in the Cambrian System on account of the conditions in Cape Breton.

The Paradoxides Fauna

The profusion of animal forms which are found in the lower gray shales of the St. John group are divided off into zones by the localization of certain Cambrian trilobites which serve as horizon markers. The following may be taken as typical:

- b. *Paradoxides lamellatus*, Hartt.
- c. *Paradoxides eteminicus*, Matt. with which are associated,
 P. micmac, Hartt and *P. acadicus* and *P. regina*, Matt.
- d. *Paradoxides abenacus*, Matt.

The oldest of these, *P. lamellatus*, is contained in a fine-grained, soft gray shale from which lime seems to be absent (or at least not plentiful), for it contains no calcareous brachiopods. A peculiarity of the fossils of this sub-zone is that it contains several species represented by more spinose varieties than occur in the succeeding sub-zone, in the same species. This horizon is also the home of Hartt's *Conocephalites* (*Liostracus*) *tener* which has no representative in the faunas of Northern Europe, and was thought to be solely American but has lately been found in the Black Mountain of southern France by Mons. J. Miquel. This peculiar species is easily recognized by the sigmoid ridge on the fixed cheek and the spineless movable cheek, for like the Scandinavian type of the genus *Liostracus*, it has no genal spine. Hartt's species *Paradoxides lamellatus*, also occurs in this subzone, and in Sweden there is a representative species (*P. ælandicus*). It will be noticed that the two species I have named while occurring together here, are separated, so far as the resembling species are concerned, in Europe, by nearly the breadth of that continent.

The central group of the above list of *Paradoxides* (c) of which *P. eteminicus* may be taken as the typical form, since it is the species of most frequent occurrence, and is confined to this sub-zone, is associated with a large and varied fauna. Characteristic species of this zone are two calcareous forms (*Protorthis Billingsi* and *Eocystites primævus*), whose presence may account for the larger amount of carbonate of lime in this sub-zone than in that below, or the one above, and perhaps for the paler gray color of the shale. In this sub-zone there are two rather rare species of *Paradoxides*, the gigantic *P. Regina* and the small *P. acadicus*; the latter species is the only one, known at this horizon, which has a granulated test, all the other species have wrinkled surfaces. This sub-zone is the head quarters of the genera *Conocoryphe* and *Ctenocephalus*, of which the former was taken by the Swedish palæontologist Angelin as the typical form of one of his divisions of the Cambrian, the "zone of the *Conocoryphes*." The second genus represented by *Ct. Matthewi*, Hartt, is perhaps the most common trilobite of this zone in the St. John basin. Varieties of the species of *Conocoryphe* and *Ctenocephalus* of this sub-zone are also met with in the sub-zone below.

The third sub-zone of *Paradoxides* is characterized by the species *P. abenacus* which resembles *P. tessini* of the Swedish Cambrian and *P. bohemicus* of Bohemia. Most of the species of this sub-zone are different from those of the sub-zone below; we notice in this sub-

zone (d) a recurrence of darker gray, finer shales, like those of the sub-zone *b* but with the absence of lime-carrying species, and an absence of a tendency to form calcareous lenses. At the western end of the St. John basin we have found very few fossils in this sub-zone, (a *Microdiscus* occurs) elsewhere the prevailing forms are *Ptychoparidæ*, especially *Solenopleura* and *Ptychoparia*. And whereas in the sub-zone *c* there are only two types of *Agnostus*, it is found that one of these types has disappeared; others have taken its place, especially such as have a tendency to the obscuration of the axial segments of the glabella, or even the entire obliteration of them on the surface of the head-shield. *Microdiscus* is also represented by its typical (but not oldest) form, for the earlier form, *M. Dawsoni*, Hartt, found in sub-zone *b1*, has disappeared.

It has been stated on a previous page that the St. John basin of Cambrian rocks was protected by ridges of volcanic rocks on each side, extruded at the beginning of Cambrian time, but these ridges did not extend to the western end of the basin, where, on the northern side, the Basal sediments of the Cambrian were deposited on the gneisses, schists and limestones of a pre-Cambrian complex.

The fauna of Hastings Cove

At one place about four miles N.E. of St. John these older supporting rocks form a belt only a mile wide, separating the St. John basin from that of the Kennebecasis R. This depression is broad, and is now partly filled by a lake-like expansion of the waters of this river; here and there along this valley are detached masses of Cambrian sediments, none of which show strata older than the base of the St. John group. Perhaps the most interesting of the patches of Cambrian rocks is that of Hastings Cove a shallow indentation of the river just E. of Drury cove. Here a limestone hill of the pre-Cambrian complex rises abruptly on the S. side of the valley leaving only a narrow margin of Cambrian strata at its foot. This consists of conglomerate with calcareous paste containing pebbles of gneiss and limestone swept down from the adjoining hill of the pre-Cambrian complex; both in the paste of the conglomerate and in an overlying shale, are parts of the tests of *Paradoxides abenacus*, hence we conclude that these fossils belong to the sub-zone *d* of the division given on a preceding page, the highest sub-zone of *Paradoxides* known in the St. John basin of Cambrian rocks. But only a few of the species seen in the latter basin can be recognized at Hastings cove, where the fauna has many small species of trilobites with heavy-knobbed or tuberculated shields, and also forms which hitherto have been thought to charac-

terize the *Olenellus* zone, such as *Olenoides* (or *Dorypyge*) *quadriceps* and *Elliptocephalus asaphoides*. While there are at this locality such forms as these, there are others that simulate the fossils of the Upper *Paradoxides* species of Sweden. With the presence here of *Paradoxides abenacus* there is strong assurance that this Hastings cove deposit is to be referred to sub-zone *d* of the *Paradoxides* zone, and that the peculiar grouping of forms is due to the gathering of the deposit on an old Cambrian shore-line exposed to a surf beating against the steeply sloping land of the pre-Cambrian hill. On the contrary the typical species of the sub-zone *d*, at the eastern end of the St. John basin, were living in a sheltered bay, free from strong currents.

Fauna of Division 2 of the St. John group

There are indications that the western end of the St. John basin was open to the ocean surf in the closing period of Division 1 (Acadian) and continued so throughout the time marked by the coarser beds of Division 2 (Johannian).; this was especially the case in the middle of this period, when the flags at several horizons are marked by ripples, or wave marks, which still witness to an impulse communicated by waves rolling in from the South and causing wave marks, the crests of which have an east and west direction. It is in this open and exposed part of the St. John basin that the measures of this division attained their greatest thickness; in this respect they are in contrast with the beds of similar age in the two interior basins (Kennebecasis River and Long Reach) where they are much thinner.

The few species of fossils found in this part of the St. John group are not of a kind to give distinct characteristics of age, since they are all *Lingulellidæ*; *Lingulella* is a genus which has representatives in all three divisions of the St. John Group.

Remarks on the nature of the deposits of the Upper Cambrian and their contained faunas are reserved for discussion in a future communication to this society.

Were there ocean abysses in Cambrian time?

The question of the antiquity of the ocean abysses and of the mountain ridges bordering the continental masses, has been mooted and discussed by various authors, and I propose in the following remarks to call attention to some characteristic features of the Cambrian deposits that appear to bear upon this theory, so far as the eastern part of Canada is concerned.

In an earlier part of this paper the writer has called attention to the independence of the faunas of the Atlantic coast from those of the interior of North America and would suggest as an explanation of this difference the existence of a land barrier along the Appalachian ridge, dividing the continental interior from the "continental shelf," spread out along the continental margin. This view was less distinctly presented in the author's presidential address to Section IV of this Society in 1891-2, based chiefly on the distribution of the Cambrian faunas from Europe toward North America.

As a further hypothesis collateral to that advanced in the address above referred to, he would now postulate the existence even in that early time (the pre-Cambrian) of a continental ridge that formed a barrier to the free mingling of the living forms which inhabited the oceans even before the Cambrian types had an existence. The differences between the species that inhabited the Atlantic coast in Cambrian time from those whose remains are found in the areas west of the Alleghanian ridge (including the coast of Labrador) is so marked, that they must have been kept apart by some physical barrier, whether difference of marine temperature, or an actual land barrier matters not, for the differences in the several faunas are convincing, that a barrier existed.

If we postulate the presence of a deep and broad abyss off the Atlantic coast in this early time, filled with icy and therefore dense water as now, and assume that this mass of cold water was constantly weighing down the subjacent part of the earth's crust, and depressing it, while the summer sun annually expanded the adjoining land, there would be a tendency in the continental border to rise and with the annual cooling to contract again and form folds of the rocks of the continental borders on a large scale; thus in winter and summer there would be a constant tendency to change in the continental border. Meanwhile the permanency and dead weight of the dense crust at the ocean bottom, to the eastward, and its overburden of chilled ocean water would exert a constant pressure on the sea-margin part of the crust, causing a thrust from the sea upon the land; hence we find from time to time periods when folded continental masses rose parallel to the coast: such a change happened in Ordovician time and again in the Devonian, and was very marked in Pennsylvania, &c., and in post-Carboniferous time. Even as late as the post-Pleiocene time there are evidences that such pressure was exercised in a small scale in the rocks that form the St. John basin of Cambrian rocks. The existence of a pre-Cambrian ridge shows that similar forces were at work in pre-Cambrian time and later in thrusting out the effusives that are so marked a feature of the Basal deposits of this region in

Cambrian time, and building up the submarine ridge which enabled the coastal species of the Cambrian faunas, to travel from Europe to America.

Beside the indications of an old "massif" beside the St. John basin and in the Kennebecasis valley, there are similar proofs of an underlying solid pre-Cambrian mass in Cape Breton. But perhaps the earliest observed of such conditions on the North American continent, and at the same time the easternmost is the description by Alexander Murray of his so-called Intermediate System in Newfoundland; especially in the peninsula of Avalon, whose numerous bays, lined N.E. and S.W. attest to movement in the strata of that projecting mass, both in Cambrian and Intermediate Time, attesting pressure from the ocean depths beyond. And the northern peninsula of Newfoundland is an ancient barrier which in Cambrian time blocked the way between the Cambrian faunas of the interior and those of the Atlantic coast.

In the address to which the writer has referred on a previous page attention was called to the source of the Lower Cambrian fauna (among others), and it was shown that those of the Atlantic Coast of North America could be traced to northern Europe, and especially to Scandinavia, and that certain genera (*e.g.* *Anopolinus*) have disappeared in the western migration of that fauna, and yet that the unity of this fauna throughout its wide extension is clearly apparent; the only exception to this relation of the Cambrian types known is that of *Liostracus tener*, which has been traced to the southern part of France.

That the barrier between the Cambrian areas of the interior of the North American continent and the Atlantic coast had a real existence, is shown by the limitation of the species *Olenellus Thompsoni* with its associated fauna, which seems not to have made its way to the New England portion of the Atlantic coast, nor to have spread eastward, beyond the district of Anse au Loupe in southern Labrador, where it and other species are found in the limestones at the top of the Cambrian sandstone on a coast otherwise composed of pre-Cambrian rocks.

The Abscission of Flower-buds and Fruits in Gossypium, and its Relation to Environmental Changes

(Abstract)

By FRANCIS E. LLOYD, F.R.S.C.

(Read May Meeting, 1916)

The purpose of the work was to determine (a) the method of abscission or "shedding" in the flower-buds ("squares") and fruits ("bolls") in the cotton plant, *Gossypium herbaceum*; and (b) the cause or causes leading up to shedding in the field. The conclusions herein set forth are based on daily records of shedding and environmental changes for the whole of two growing seasons, 1911 and 1912 at Auburn, Ala., together with experimental data obtained during a third season, 1913, at West Raleigh, N. Car. Records embodying data obtained on alternate days during 1906 and 1907 at Auburn, Ala., were placed at the writers disposal, and the present study has embraced these also. The environmental factors measured were rainfall, soil and air temperatures, superficial soil moisture and evaporation (atmometrically).

THE METHOD OF ABSCISSION

The method of abscission is essentially identical with that which the writer has described at length for *Mirabilis Jalapa*¹ and consists fundamentally in the alteration of cell-membranes (pectose and cellulose) by hydrolysis, so that one transverse tier of cells is set free from the next tier above. The actual completion of this hydrolysis is preceded by more or less growth in the lower tier of cells, usually, though not always, accompanied by cell-division in these cells. The older the organ, the more extensive the cell-division; in very young bolls, it may not intervene. But while the occurrence of cell-division appears to depend on the age, and therefore on the size and condition of the membranes in the organ involved, the evidence obtained strongly suggests that the intensity of the stimulus and the consequent rapidity of the response, are also in some degree responsible. The exact period required for the reaction of abscission, is, for reasons

¹ Lloyd, F. E. *Abscission in Mirabilis Jalapa*. Bot. Gaz. 61: 213-230. pl. 13 March, 1916.

pointed out by Hannig¹ difficult to determine. If this period is regarded as delimited by the earliest evidences of histological activity and the condition when final separation is possible, it may be, for young bolls, less than four hours. This was determined by injuring bolls sufficiently to ensure practically 100% abscission within 24 hours. In 16 hours there was no evidence of histological activity, while 4 hours later the process was practically complete. The reaction period for larger bolls has not been determined, but as from one to five cell-divisions may take place and as the physiological activities of the abscission cells have to overcome the resistance of variously indurated membranes, the period in question must be longer.²

SHEDDING AND THE ENVIRONMENT

In order to correlate the fluctuations in the march of shedding with changes in the environmental factors, it was necessary to determine the length of the abscission period (the whole period between the imposition of the stimulus and the final completion of the response) in the field, following a variety of stimuli. This was done (a) by the analysis of the data obtained by tracing the history of 579 flowers which ultimately were shed; and (b) by experiments *ad hoc*. These experiments consisted of inflicting injury in various degrees to squares and to bolls; of removal of portions of the root systems; of intercepting the water-current to the plant as a whole or to the bolls in particular by the excision of tissues in suitable places; of prejudicing fertilization by applying water to the pollinated stigmas, and correlating the results in shedding so obtained with those following rain at various times of the day, so far as occasion offered.

Conclusions from experiments. The results of injury to squares and bolls show that the abscission period may be as brief as 24 hours, for the youngest bolls, to three days for bolls 25 mm. in transverse diameter.

The observed periods for all kinds and sizes of squares and bolls (30 mm. or less) were six days or less. Bolls larger than 30 mm. transverse diameter are seldom shed in the field. In view of the drastic treatment it may be inferred that these are responses of maximum rapidity at the temperatures which prevailed, these corresponding to the usual summer field temperatures. It was found that squares do not shed quite so readily as small bolls, the reason for which is

¹ Hannig, E. Untersuchungen über das Abstossen von Blüten u. s. w. Zeitschr. f. Botanik. 5: 417-469. 1913.

² Lloyd, F. E. Abscission. Ottawa Naturalist. 28: 41-52. June-July; 61-75. Aug.-Sept. 1914.

obscure. There appears also to occur an inhibition period during flowering so that abscission is usually consummated either before or after, but not during anthesis. There was no evidence from which it could be certainly concluded that the period for small and large squares were different in length. When the operations were performed in the evening, the responses followed more rapidly in both bolls and squares by about 12 hours. The cause of this appears to lie in the night period of high turgidity following the operation.

Large bolls occupy more time in abscission than small ones because of the greater amount of tissue to be affected and because of its character. Complete shedding in a literal sense is not possible in some instances in which the abscission tissues run obliquely down the stem. This becomes more manifest with increasing age, serving to illustrate the possible resistance to abscission offered by older tissues. When older bolls can be shed at all, the period required is scarcely more than two to four days longer than that for small bolls.

The stimuli applied by wounding are however probably much more intense and are followed by shorter response periods than those which usually obtain in the field, excepting severe insect injury and those following, say, a very hot wind, such as the simoon in Egypt. Since there is no doubt of the relation between intensity of stimulus and rapidity of response, it became necessary to imitate field conditions, as far as might be possible, in order to determine the time limits of periods for responses of minimum rapidity. From branches kept in a humid atmosphere the bolls and squares were shed over a period of eight days with a maximum on the third or fourth, squares being somewhat less ready to respond than bolls. Root-pruning experiments though less conclusive under the conditions under which they were done showed that the response period lay within four days. The destruction of the pollen by water shortly after pollination was followed by a high percentage of shedding covering a period extending from the fourth to the ninth day inclusive, with the maximum frequency on the sixth day. The same cause, but imposed by rain, had the same result with high frequencies on the sixth and eighth days. Slight injury, sufficient merely for the removal of parts to prevent fertilization and reducing the possible wound-shock to a minimum, produced results quite in accord with the above, the consequent shedding occurring from the third to the tenth days inclusive, with the maximum frequency for all operations on the sixth. A greater amount of injury, but not so severe as in those referred to in a previous paragraph and done in such a manner as to imitate the initial injury inflicted by insect larvæ, caused shedding on the third to the eighth days thereafter, with the maximum on the fifth.

The frequencies of the shedding responses following boll-weevil injuries are determined by the intensity of stimulus, oviposition causing relatively little, and the feeding of the larva the most shedding.

From these experiments taken all together, it may be concluded that stimuli supplied under field conditions usually make themselves evident as total responses within ten days, with the maximum frequency not later than the sixth day, especially during the earlier portion of the season. This conclusion receives support from the difference in size of shed bolls and persistent bolls, the difference being a measure of the length of the time the total response has occupied, assuming that growth is inhibited as a part of the general abscission response. This period proves to be four to six days. When larger bolls are involved, as may occur under severe conditions which are more likely to prevail at the end of the season, the abscission period is increased. It was found, in 1907, that after flowering had ceased, the periods required to account for the shedding rates observed was in the neighbourhood of eight, or, as a probable maximum, ten days.

Conclusions from observation of shed bolls. The conclusions thus arrived at receive further support from the detailed history of particular flowers. The data, which were derived from the individual records of 579 flowers during the season of 1912, show that the ages at which bolls are shed under field conditions were from two to 25 days. The highest frequencies were for bolls of four to eight days, the data for two sets of plants, taken separately (lots 2 and 5, 1912), indicating that under more stringent conditions as to water supply the highest frequency may be for bolls four days old, under less stringent circumstances six days.

By experiments it was shown that bolls may be shed when one and two days old in relatively high frequencies, in response to stimuli applied before anthesis, provided the stimuli applied are severe enough. The shedding of open flowers, meaning the intervention of the response between the beginning and end of anthesis (regarding the first 24 hours after the first opening of the flower as the period of anthesis), appears not to take place. There appears therefore to occur an inhibition of abscission for this period. When open flowers are recorded as shed, it has always been evident that abscission was complete at the beginning of anthesis.

It seems therefore highly probable, amounting almost to a certainty that, when *bolls* are shed in the field, the stimulus accountable for their shedding occurs at or subsequent to anthesis in the great majority of cases. The abscission period for any bolls found to be shed will therefore be equal to or less than its age. When shed as the result of inadequate fertilization the age and abscission period are

practically equal; otherwise and usually less. This finding permits us to look for the cause leading to a maximum shedding response within six days previous to the date on which such a maximum falls. We cannot expect a high frequency of shedding referable to a given stimulus later than six days after its occurrence, except at a time when the numbers of young bolls are reduced, due to the cessation of flowering and the consequent increase in the abscission period because of the greater proportion of older bolls as already indicated.

THE MARCH OF SHEDDING

Proceeding from the above conclusions, the march of shedding for each of four years, 1906, 1907, 1911 and 1912, at Auburn, Ala., has been examined and the following general conclusions drawn:

There is always observable a steadily increasing total shedding rate, first of squares, and, as the bolls appear, of these also. The cessation of growth is the immediate limitation of square shedding; of flowering, that of bolls, having due regard to the ultimate shedding of older bolls. At first the rate of shedding is relatively less, regarding the number of flowers as a standard, and later, relatively greater. The adjustment of the plant to its environment is relatively better earlier in the season, and worse later on. So far as it has been possible by elimination to determine the cause of this increasing maladjustment, it would seem most probable that it is due to a condition which itself is constantly changing from a more to a less favourable with respect to the plant. This appears with a high degree of certainty to be the gradual reduction of the soil-moisture content of the deeper reaches of the soil, that, namely which is in contact with the lower root-system. That such a reduction of soil-moisture actually takes place during the growing season is shown by records of the levels of well-water, in which it appears that the water-table is gradually lowered during the spring and summer, and does not begin to rise appreciably till the advent of winter rains. If all other environmental conditions other than this, namely, the deeper soil-moisture, were constantly at their optimum for the plant, the steady lowering of the deep-soil-moisture would put an increasingly more stringent tax on the plant, causing increasingly greater shedding rates relative to the number of flowers, or, what is the same thing, to the size of the plant.

The shedding rates do not, however, increase uniformly. As a matter of fact there are always fluctuations in these rates, indicating corresponding changes in the character of the remaining environment, now more favourable for the plant, now less. Changes which combine to increase the loss of water from the plant increase the shedding rates,

while those which increase the availability of soil-moisture, as by bringing more water into contact with the superficial root-system, or by decreasing the flow of water from the plant, ameliorate its condition for the time being. As the season advances, however, the mean of these fluctuations in shedding rates is always increasing, the change in the mean being the index of a steadily increasing shedding rate due to the gradual depletion of subterranean soil moisture. The end of this increase is determined by the material available for shedding and the stringency of conditions which obtain before the bolls have obtained a size which enables them to resist abscission. Even when this happens, the conditions imposed by the environment may still cause hindrance to the maximum development of parts as, e.g., the cotton fibre, although with this the present paper does not deal.

The amount of boll shedding and that of square shedding appear to be nearly equal, relatively to the forms available for shedding, aside from that additional boll shedding due to inadequate fertilization and possibly also to other undetermined causes. It has been proved that rain falling in the day-time, especially at or near certain hours, can procure a large amount of boll shedding, amounting to 70 per cent. of the flowers in an observed instance. From data for the history of individual flowers (1912) it has also been shown, with a very small probability of error, that high maxima (involving the loss of 100 per cent. of the flowers) do occur from this cause. In the absence, however, of the individual records of flowers and their subsequent history day-by-day, it is never possible to do more than estimate the maximum possible effect, and this usually teaches us very little, that little becoming more perhaps when viewed in the light of concurrent evidence. Any study of shedding in a region where there is repeated rainfall, must, in order to be adequate, include the subsequent history of a sufficient number of the particular flowers subjected to day-time rains.

The view that the limitation of the water supply, and therefore of the water content of the plant, is answerable for shedding, does not however rest merely on the data derived from shedding records alone. A study of the transpiration rates, water deficit in leaves and stem during rainless spells, daily cessation of growth or measurable shrinkage of tissues and the closure of stomata, all indicate quite clearly that there seldom occurs a day on which there is no minus water fluctuation in the plant. It is certain, however, that the water deficit is less on, or just after, a rain-day, but can become very pronounced in the course of a few days thereafter. When this takes place shedding at relatively high rates intervenes within the expected period. The effect is not, however, a direct one. The studies upon which these conclusions

are based, together with those of Balls¹ in Egypt, indicate that the water deficit is the cause of rise of temperature in the tissues, and that this constitutes the stimulus which directly leads to abscission.

If the general conclusion that the grand march of shedding is due to the depletion of moisture in the deeper soil be true, irrigation and better soil manipulation are indicated as remedies. It has been shown experimentally by Barre² in South Carolina, that irrigation has the effect of inhibiting shedding. The observations of Balls that the rise of the water-table in Egypt due to the Nile floods, by asphyxiating the deeper roots and so limiting the water-supply, causes severe shedding, are quite in harmony with the above findings, since too much water may have quite the same effect as too little, and suitable drainage is thereby indicated as surely as irrigation. It remains to suggest also that the use of fertilizers on the soil which tend to increasing its water-holding capacity may also contribute to a desirable result.³

The belief has been expressed that high temperatures are also responsible for shedding. It is however very questionable that the highest air-temperatures recorded during the four seasons in question, (90 to 100 degrees Fahr.) have been directly responsible, but rather that, with high temperatures there may occur, if other conditions contribute their effect, higher transpiration rates, and marked daily wilting with closure of the stomata,⁴ inevitably procuring high internal temperatures which may be effective.

The data upon which the above results rest will appear in full elsewhere.

¹ Balls, W. Lawrence, *The Cotton Plant in Egypt*, pp. 202, London, 1912, and several other contributions.

² Unpublished results kindly communicated to me by letter.

³ Mr. R. G. Arnold has written me that during a period between July 25 and Aug. 5, during which shedding was marked in adjoining ground, the shedding in an experimental plot was entirely checked by the application of 200 pounds of sodium nitrate.

⁴ Lloyd, F. E. *Leaf Water and Stomatal Movement in Gossypium*, and a *Method of Direct Visual Observation of Stomata*. *Bull. Torr. Bot. Club.* 40: 1-26, Jan. 1913.

*Studies on the Protozoan Parasites of the Fishes of the Georgian Bay*¹

By J. W. MAVOR, B.A., Ph.D.

(PRESENTED BY DR. E. E. PRINCE, F.R.S.C.)

(Read May Meeting, 1916)

CONTENTS

	PAGE
1. Introduction.....	63
2. Methods.....	64
3. Description of Protozoa found.....	64
A. Haemoflagellates.....	64
<i>Trypanoplasma borreli</i> , Laveran et Mesnil.	
B. Myxosporidia.....	66
a. <i>Myxidium lieberkühni</i> , Bütschli,	
from the urinary bladder of <i>Lucius lucius</i> .	
b. Myxosporidian from the urinary bladder of <i>Stizostedion vitreum</i> .	
c. <i>Myxobolus notatus</i> , sp. n.	
4. Table of fishes searched.....	72
5. Bibliography.....	73

1. INTRODUCTION

This investigation was carried on at the Biological Station of the Canadian Government at Go Home Bay on the Georgian Bay, about twenty miles from Penetanguishene, during the summer of 1913 while the writer was curator of the station. The objects have been to ascertain the distribution and frequency of fish diseases in the southern part of the Georgian Bay and to determine the causal agents when these were protozoa.

Fourteen different species of fish have been examined. Time and other considerations limited the examination in many cases to only a few individuals of each species. Three different protozoan parasites have been found. One of these, which was found in the gall bladder of all pike examined, is quite harmless. Another forming cysts in the muscles of the minnow, although injurious to the fish, is fairly rare, occurring in only 6% of the individuals. The last, found in the blood

¹ The material for these studies was collected and part of the work was done while the author was curator of the Biological Station of the Canadian Government at Go Home Bay, Ontario. The studies were completed in the Zoological Laboratory of the University of Wisconsin. The writer wishes to express his indebtedness to the Directors of the Biological Board of Canada for the privilege of working at the Biological Station and the permission to publish the results here.

of the sucker, is possibly fatal to this host.

It is believed that the blood parasite has been brought over to Canada in the German Carp. The parasite of the urinary bladder of the pike, *Myxidium lieberkuhni* is identical with the parasite of the pike in Europe. These two cases indicate the possibility of fish diseases being introduced with fish brought over from Europe and the spread of the parasite to purely Canadian fishes.

The parasite forming cysts in the muscles of the minnow *Pimephales notatus* is a new species.

2. METHODS

In searching for parasites the external surface and gills were first gone over carefully. The fish was then opened and the viscera were examined macroscopically. In some cases the blood from the heart or gills and the contents of the urinary and the gall bladders were examined in fresh preparations under the microscope. The following table gives a list of the fishes searched and the parasites found in them.

In the case of the trypanoplasm found in the sucker, in addition to fresh preparations of the blood, smears were fixed in the vapour of osmic acid, dried, stained with Giemsa's azur-eosin and mounted in Canada balsam. The myxosporidian parasites were studied in fresh preparations, "wet" smears fixed in Schaudinn's fluid and stained either in Delafield's haematoxylin or Giemsa's azur-eosin and sections of infected tissue fixed in Schaudin's fluid, cut in paraffin and stained with Delafield's haematoxylin, Heidenhain's iron haematoxylin, or Giemsa's azur-eosin. For further details of the methods used see Mavor (:15).

3. DESCRIPTIONS OF PROTOZOA FOUND

A. Haemoflagellates

Trypanoplasma borreli, Laveran et Mesnil ²

As seen in the living state in fresh preparations of the blood of the common sucker, *Catostomus commersonii*, Lacépède, this trypano-

² A more detailed description of this parasite and discussion of its identity has been already published by the author (Mavor, 1915a).

plasm has an elongated body from which arise two flagella, one directed anteriorly (Fig. 1, A, a. f.), the other posteriorly. The posterior flagellum (p.f.) forms the margin of an undulating membrane

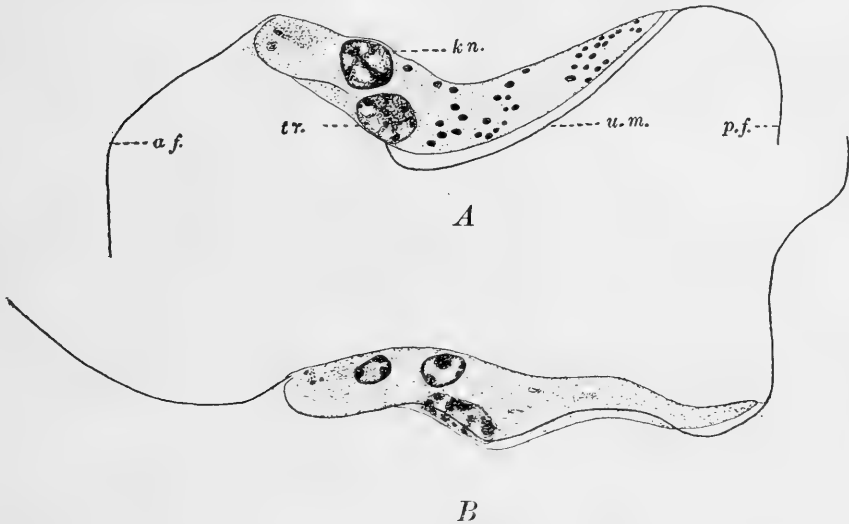


Fig. 1. *Trypanoplasma borreli*, Laveran et Mesnil, from the blood of the sucker, *Catostomus commersonii*. A, Form with a single kinetonucleus. B, form with two kinetonuclei. a.f., anterior, p.f., posterior flagellum; u.m., undulating membrane bounded by posterior flagellum; tr., trophonucleus; kn., kinetonucleus. Drawn with the camera lucida from dry smears fixed with osmic acid vapour and stained with Giemsa's azur-eosin. x 2700.

(u.m.) extending the length of the body and is continued posteriorly as a free flagellum for a length about equal to two-thirds of the length of the body. The measurements of the body are, length 20–25 μ , thickness 3–4 μ . The lengths of the flagella are, anterior 14–16 μ , posterior (including only the free portion) 14–16 μ . The parasites performed rapid writhings of the body accompanied by lashing of the flagella and undulations of the membrane but showed little progression.

The endoplasm contains numerous granules measuring up to .4 μ in diameter and staining deeply with Giemsa's azur-eosin (Fig. 1,A). The kinetonucleus (Fig. 1, A, kn.) is situated about one-third of the length of the body from the anterior end, where the two flagella arise, and is on the side opposite to that to which the undulating membrane is joined. The trophonucleus (Fig. 1, A, tr.) is situated slightly behind the kinetonucleus and on the same side as the undulating membrane. The kinetonucleus stains purple while the trophonucleus stains red, with Giemsa's azur-eosin. Both nuclei are surrounded

by membranes. In some cases, about twelve per cent., the kinetonucleus is double, each part being surrounded by a separate membrane (Fig. 1,B).

If the foregoing description be compared with that of Laveran et Mesnil (:02) for *Trypanoplasma borreli* it will be found that the parasite of the sucker possesses all the characters described for *T. borreli*. It has therefore been assigned to this species. Additional evidence on this point will be obtained when it is determined whether or not the carp in the Georgian Bay harbour *T. borreli*. Efforts are to be made to determine this.

The sucker in which this parasite was found was sluggish and allowed itself to be easily picked up in a dip-net. It was brought to the laboratory in a pail and when taken out of the water to be examined died quickly. When examined no external or internal lesions were found, but the fish showed an anaemic condition. There is not sufficient evidence to show that the trypanoplasma was a cause of this anaemic condition. However *Trypanoplasma borreli* is known so cause such a condition in carp in captivity (Mariane Plehn :04, p. 175 and Keysselitz :06, p. 15).

The occurrence of this trypanoplasma in the sucker is of importance as showing the possibility of its having been transferred to this fish from the carp which has been introduced into the Canadian lakes and occurs not far from where the sucker was caught. The case is also important in showing the possibility of *T. borreli* causing a pathogenic condition in a fish in the wild state. There is a further interest in the occurrence of what appears to be a parasite of European fishes in Canadian waters.

B. Myxosporidia.

a. *Myxidium lieberkühni*, Butschli.

This parasite was found in the urinary bladders of each of the three pike (*Lucius lucius*, L.) in which this organ was examined microscopically. It appeared to be non-pathogenic. In one case it was very abundant, the walls of the bladder being completely covered by attached myxosporidia.

The myxosporidium varied greatly in size, reaching a length of 170μ . It may be elongate, branched, piriform or round. As seen in fresh preparations the ectoplasm is without granules, and shows at times numerous fine processes (Fig. 2,e). In prepared sections of the urinary bladder the parasite was found attached to the epithelial wall of the bladder (Fig. 2, g-i). The endoplasm in fresh preparations

showed two kinds of granules; large colorless granules up to 8μ in diameter and smaller greenish granules 1 to 1.5μ in diameter. The greenish granules are by far the most numerous. When stained with Giemsa's azur-eosin the first are a deep red, the second yellowish in color. No haematoidin or other crystals were found,¹ an inclusion described in *M. lieberkühni* in European pike by Cohn ('96). Also the "Mesoplasma" described by the same author as between the ectoplasm and endoplasm was not observed. The absence of these two characters may be due to the particular period during which the parasite was studied by the writer. The nuclei which measure from 1 to 2μ in diameter are surrounded by a deeply staining membrane and contain three or four chromatin granules staining deeply with haema-

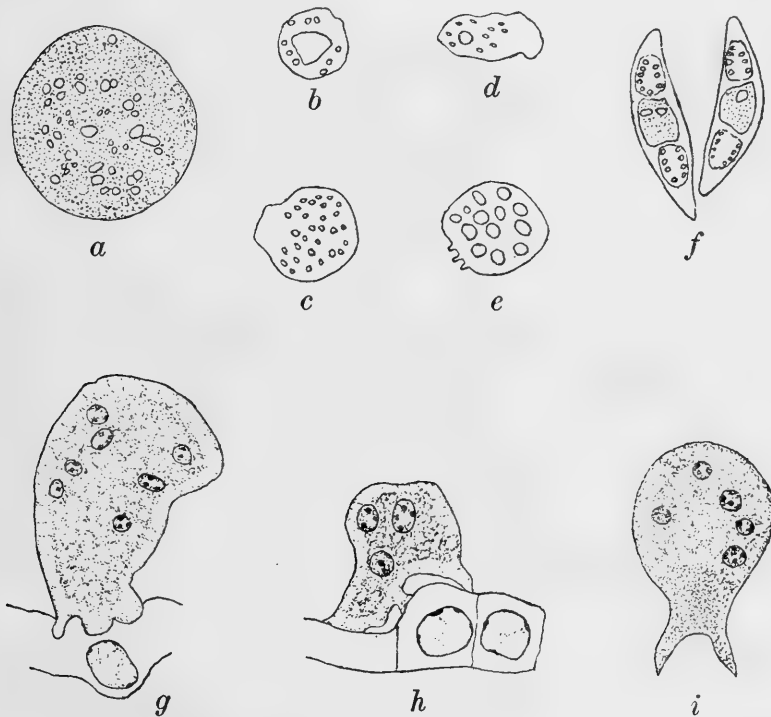


Fig. 2. *Myxidium lieberkühni*, Butschli from the urinary bladder of the pike, *Lucius lucius*. a-e, myxosporidia free in the urine; f, spores; g-h, myxosporidia attached to the epithelial wall of the bladder; i, myxosporidium detached from wall; a-f, drawn from fresh preparations; g-i, drawn from sections of the urinary bladder stained with Delafield's haematoxylin. a-e, $\times 660$. f, $\times 1420$. g-i, $\times 1480$.

¹. The author has since found haematoidin crystals in *myxidium lieberkühni* from pike caught in Wisconsin.

toxylin. The nuclei vary greatly in number, the number seeming not to correspond in any way with the size of the myxosporidium. Some of these nuclei undoubtedly show division, but the details of this process have not been worked out. No pansporoblasts, sporoblasts, or spores were found in the myxosporidia.

The spores, only two of which were found floating freely in the urine, are spindle shape with the axis of the spindle shape with the axis of the spindle (in this case at right angles to the axis of the spore as defined by Thelohan, '95) curved (Fig. 2,f). The measurements of the spore are, width (the long axis of the spindle) $17-18\mu$ length (measured at the middle at right angles to the axis of the spindle) 5μ . The polar capsules, of which there are two, one at either side of the spore, measure 4μ in length. They each contain four or five coils of filament. No attempt was made to extrude the filaments. The sporoplasm fills the rest of the spore. In one case two nuclei could be clearly seen in the sporoplasm (Fig. 2, f.).

The characters given above enable the parasite to be recognized as *Myxidium lieberkühni*, Bütschli found in *Lucius lucius* in European waters. For descriptions of the *M. lieberkühni* see Bütschli ('82) and Cohn ('96).

C. Myxosporidian from the urinary bladder of *Stizostedion vitreum*.

This myxosporidian was found in the urinary bladders of each of three pike-perch (*Stizostedion vitreum*, Mitchill), being the total number in which the urinary bladder was examined microscopically. Like the parasite of the pike it seems to be nonpathogenic. The parasite was found both free in the urine, (Fig. 3, a-d) and attached to the wall of the bladder (Fig. 4). The free forms vary greatly in shape, being rounded, elongated or branched. The largest measured 200μ in its greatest diameter. An ectoplasmic layer was clearly to be distinguished. In certain cases this layer was produced into fine processes, such as might serve for attachment (Fig. 3, d). In a stained smear the parasite was found attached to the epithelial cells, by a large area of ectoplasm which stained rather deeply (Fig. 4). In the fresh state the endoplasm was filled with greenish granules. Stained preparations show very numerous nuclei measuring 1.5 to 2μ in diameter in the larger myxosporidia. In many respects the myxosporidium resembles that of *Myxidium lieberkühni* found in the pike.

No spores or sporoblasts were identified. Without knowing the method of spore-formation and the structure of the spore it is impossible to assign the parasite to its genus and species. So far as the writer

is aware, no myxosporidian parasite has been recorded from the urinary bladder of *Stizostedion vitreum*.

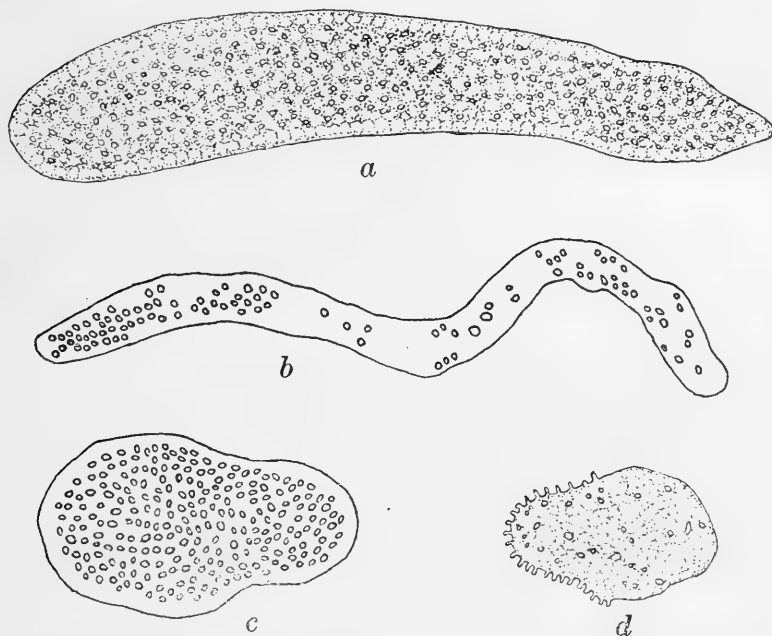


Fig. 3. Myxosporidia drawn from fresh preparations of the urine of the pike-perch, *Stizostedion vitreum*. Drawn with the camera lucida. x 660.

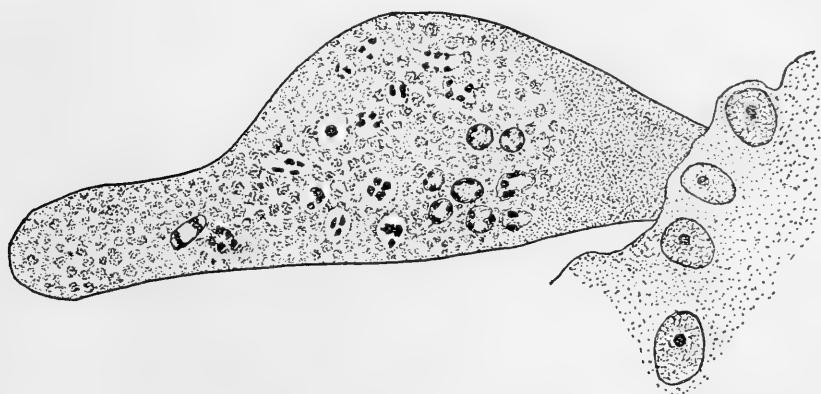


Fig. 4. Myxosporidium from the urinary bladder of the pike-perch, *Stizostedion vitreum*. Drawn with the camera lucida from a "wet" smear preparation stained with Delafield's Haematoxylin. x 1480.

C. *Myxobolus notatus*, sp. n.¹

Characters : Cysts as large as 3 mm. in diameter in the connective tissue of the voluntary muscles. Spores piriform, length $17-18\mu$, width $7.5-8\mu$, with a posterior extension forming a tail 5μ in length and as broad as the spore. An iodophilous vacuole in the amoebula. One polar capsule length 7μ , width 4μ . Filament 95μ .

Habitat: the blunt-nosed minnow, *Pimephales notatus*, Rafinesque.

The cysts cause swellings which are easily recognized externally on the sides or tails of the fish. The parasite was found in 6% of *Pimephales notatus* examined. It was not found in other minnows, *Notropis blennioides*, and *N. cornutus* caught with *P. notatus*.

The cysts are surrounded by a dense layer of connective tissue (Fig. 5, con. tis.). Inside this covering there is what appears to be a layer of columnar epithelial cells (epth.) between the connective

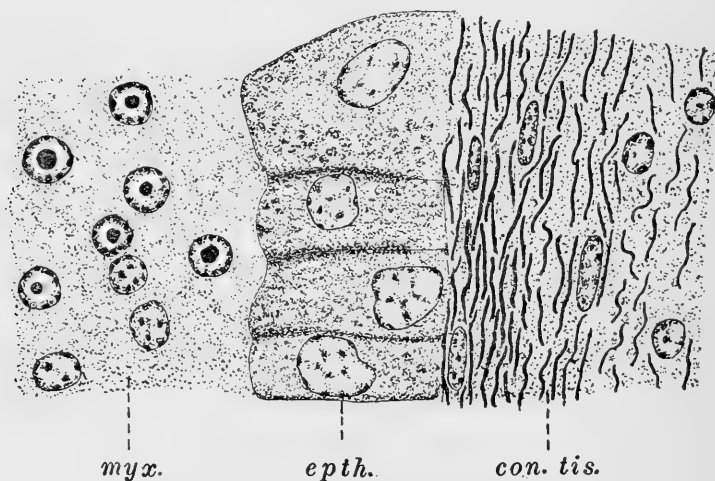


Fig. 5. *Myxobolus notatus*, sp.n. Outer edge of cyst. myx., outer edge of myxospore; epth., epithelial layer; con. tis., connective tissue. Drawn with the camera lucida from a section stained in Delafield's haematoxylin. $\times 2600$.

tissue and the myxospore. The writer is unable to explain the origin or significance of this layer. It shows very clearly in the sections and completely surrounds the cysts. The apparent division into columnar cells and the structure of the nuclei of these cells make it difficult to consider it as a part of the myxospore. On the

¹ The author is indebted to Dr. B. A. Bensley for telling him of the existence of this myxospore.

other hand the cells show no resemblance to the connective tissue cells adjacent to them. In the two older of the three cysts sectioned this layer is uneven and dis-continuous. No reference to such a layer in a myxosporidian cyst has been found in the literature (Auerbach :10, Pfeiffer '91, '93).

A distinct division into ectoplasm and endoplasm is not seen in the myxosporidium although it is surrounded by an area devoid of nuclei. This absence of a distinct ectoderm throws doubt on the existence of the columnar epithelium. The writer hopes to obtain additional material and stages for a more detailed study of this question. In the outer part of the endoplasm numerous single nuclei with a karyosome surrounded by a clear area may be seen. Further toward the centre are found pansporoblasts with two, four, etc., nuclei. In each pansporoblast two sporoblasts are formed.

The sporoblasts contain six nuclei, two parietal nuclei (Fig. 6, A, p.n.) concerned with the formation of the spore envelope, two nuclei (n.c., n.c.') of the capsulogenous cells, and two nuclei in the amoebula (am.). One of the capsulogenous cells degenerates (n.c.'), and only one capsule is formed in the spore. In the ripe spore an iodophilous vacuole (B, C, id.v.) is developed.

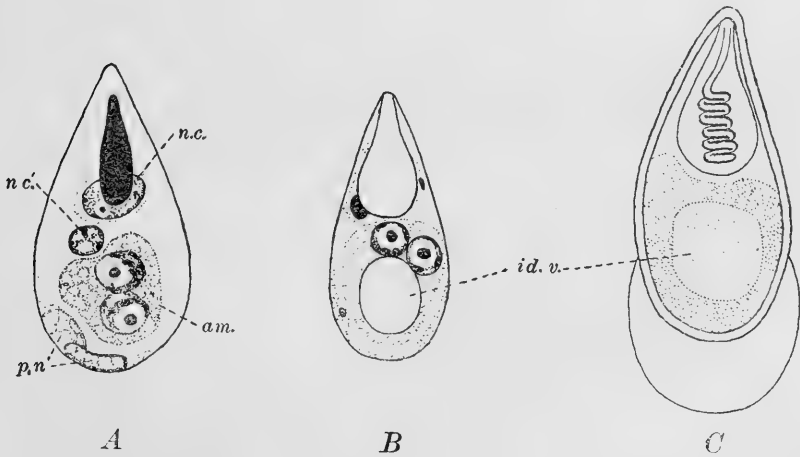


Fig 6. *Myxobolus notatus*, sp.n. Spore formation. A, Sporoblast; B, contents of ripe spore; C, spore. n.c., nucleus of polar capsule cell in which capsule is forming; n.c.', nucleus corresponding to second polar capsule cell which degenerates; p.n., two parietal nuclei; am., amoebula containing the two germ nuclei. A and B drawn from "wet" smears stained with Delafield's haematoxylin, C from a fresh preparation. x 2600.

4. TABLE SHOWING THE FISHES SEARCHED AND THE ORGANS IN WHICH PROTOZOAN PARASITES WERE FOUND

	Integument		Viscera and Gills		Muscles		Gall Bladder		Urinary Bladder		Blood	
	No. Ex.	No. Inf.	No. Ex.	No. Inf.	No. Ex.	No. Inf.	No. Ex.	No. Inf.	No. Ex.	No. Inf.	No. Ex.	No. Inf.
<i>Ameiurus lacustrio</i> . . . (Great Lake catfish)	1	0	1	0	1	0						
<i>Ameiurus nebulosus</i> . . . (Common bulhead)	1	0	1	1 cyst and gills	1	0			1	0	1	0
<i>Catostomus commersonii</i> (Common sucker)	2	0	2	0	2	0					2	1
<i>Coregonus clupeaformis</i> (Whitefish)	20	0	20	0	20	0						
<i>Cristivomer namgycush</i> . (Lake trout)	4	0	4	0	4	0						
<i>Lota maculosa</i> (Ling)	1	0	1	0	1	0	1	0	1	0		
<i>Lucius lucius</i> (Pike)	9	0	9	0	9	0	1	0	3	3	1	0
<i>Micropterus dolomieu</i> . . (Small-mouthed bass)	3	0	3	0	3	0			1	0	1	0
<i>Micropterus salmoides</i> . (Large-mouthed bass)	1	0	1	0	1	0						
<i>Notropis blennioides</i> (Minnow)	128	0			128	0						
<i>Notropis cornutus</i> (Minnow)	33	0			33	0						
<i>Perca flavescens</i> (Perch)	1	0	1	0	1	0						
<i>Pimephales notatus</i> (Minnow)	263	0			263	15						
<i>Stizostedion vitreum</i> . . . (Pike-perch)	7	0	7	0	7	0	2	0	3	3	1	0

No. Ex., number of fish in which this organ was examined.

No. Inf., number of fish in which the organ was found to be infected.

5. BIBLIOGRAPHY

Auerbach, M.

:10 Die Cnidosporidien, Leipzig.

Bütschli, O.

'82 Bronns Klassen u. Ordngn. des Tierreichs. Bd. 1, 2. Aufl.

Cohn, L.

'96 Über die Myxosporidien von *Esox lucius* und *Perca fluviatilis*. Zool. Jahb. Abt. f. Morphol., Bd. 9, p. 227.

Keysseltz, G.

:06 Generations-und Wirtswechsel von *Trypanoplasma borreli* Laveran et Mesnil. Arch. f. Protistenk. Bd. 7, p. 1.

:08 Die Entwicklung von *Myxobolus pfeifferi*. Arch. f. Protistenk. Bd. 11, p. 252.

Laveran, A. et F. Mesnil.

:02 Des Trypanosomes des Poissons. Arch. f. Protistenk. Bd. 1, p. 475.

Mavor, J. W.

:15 Studies on the Sporozoa of the Fishes of the St. Andrews Region, New Brunswick. Contributions to Canadian Biology, Supplement to the 47th Annual Report of the Department of Marine and Fisheries, Ottawa. Sessional paper No. 39 b.

:15a On the Occurrence of a Trypanoplasm, probably *Trypanoplasma Borreli* Laveran et Mesnil, in the blood of the common sucker, *Catostomus commersonii*. Journ. of Parasitology, Vol. 2, p. 1.

Pfeiffer, L.

'91 Die Protozoën als Krankheitserreger. 2. Auf. Jena.

'93 Der Parasitismus des Epithelcarcinoms sowie der Sarco-Micro-und Myxosporidien im Muskelgewebe. Centralbl. f. Bakteriologie u. Parasitenkunde Bd. 14, p. 118.

Plehn, Murianne.

:04 *Trypanoplasma cyprini*. Arch. f. Protistenk. Bd. 3, p. 175.

Thélohan, P.

'95 Recherches sur les Myxosporidies. Bull. Sci. France et Belgique, Tom. 26, p. 100.



Notes on the Plankton of the British Columbia Coast

By J. PLAYFAIR McMURRICH, Ph.D., F.R.S.C.

(Read May Meeting, 1916)

Little attention has as yet been given to the plankton of the British Columbia coastal waters, the only references to the subject that I know of being those of Peck and Harrington¹ and Herdman,² both these papers referring to collections made in Puget Sound. It has seemed advisable, therefore, to place on record the following notes, since, even although they are based upon but a small number of collections, they represent a much more extensive area and add materially to our knowledge of the forms represented in the West Coast plankton.

The occurrence of plankton in sufficient quantity to discolour the water over considerable areas is a well-known phenomenon, but in my experience it happens much more frequently in Pacific waters than in the Atlantic. In a voyage up the coast of British Columbia in September, 1912, several patches of "brown water" were observed, and the opportunities which presented themselves for obtaining samples of the plankton causing the discolouration were eagerly seized. Circumstances did not permit the examination of the collected material in the living condition, but it was preserved in formalin, and even although for various reasons it was necessary to postpone its examination until now, it was found to be still in excellent condition for the identification of its constituents.

1. The first patch of "brown water" examined was encountered in the northern part of the Gulf of Georgia, and while it was not convenient at the time to slow down the ship sufficiently for the use of a tow-net, I was able to secure some bucketfuls of the water and found the discolouration due to the enormous numbers of *Pyrocystis*. The preserved material has unfortunately been lost, and I am unable to identify the form specifically, but the examination of the fresh material, made with a low power of the microscope, revealed practically nothing but this single form which must have been present in almost incalculable numbers, since the discoloured area was of very considerable extent. This was the only case observed in which the plankton

¹ J. I. Peck and N. R. Harrington—Observations on the Plankton of Puget Sound. Trans. N. Y. Acad. Sci. XVI. 1898.

² W. A. Herdman, J. C. Thompson and A. Scott—On the Plankton collected continuously during two Traverses of the North Atlantic, etc., with an Appendix on dredging in Puget Sound. Trans. Liverpool Biol. Soc. XII. 1898.

causing the discolouration was practically monotonic; in all other cases I found it very varied as will be seen. My friend, Dr. McLean Fraser, informs me, however, that on two occasions he has observed the water of Departure Bay discoloured over large areas by a plankton which consisted almost entirely of a single species, in the one case an undetermined Dinoflagellate, and in the other a species of Noctiluca. With the latter form there was some admixture of diatoms, copepods, nauplii, etc., but the flagellate was estimated to form at least 95% of the entire material.

2. On September 11th a patch of "brown water" of some extent was encountered off the entrance to Esperanza Inlet, on the West coast of Vancouver I., and a collection made from it revealed a remarkable and interesting variety of forms.

The only Diatom observed was *Coscinodiscus*, which was not, however, present in any considerable numbers and is identified with some hesitation with *C. nobilis*, Grun. Of the Dinoflagellata, *Ceratium fusus* was quite common, while *C. furca* and *C. tripos*, though present, were very rare.

With the exception of these forms the plankton was entirely composed of animal forms. No Protozoa were observed, but of Coelentera, several forms were present. In the first place a few hydrotkeae were obtained, in all cases quite empty but belonging apparently to at least two species of Campanularian hydroids. One of them I was not able to identify; the other, represented by hydrotkeae whose length and breadth were about equal, which lacked any indications of dentations at the margin and were covered more or less abundantly with villousities, probably due to wear and tear, my friend, Dr. C. McLean Fraser, kindly informs me was probably *Obelia longissima*.

An Anthomedusan belonging to the genus *Rathkea* was present in considerable numbers. It is apparently *R. blumenbachii* (Rathke), a form originally described from the Black Sea, but held to be identical with *R. octopunctata* of the north Atlantic. It has recently been described by Bigelow,¹ 1913, from Behring Sea and probably has a circumpolar distribution.

This last remark is also applicable to the Siphonophore *Diphyes appendiculata* Eschscholtz, originally described² from the north Pacific, but also forming an important constituent of the plankton of the Mediterranean, *Diphyes tripartita* Costa being regarded as identical

¹ H. B. Bigelow—Proc. U. S. Nat. Mus. XLIV, 1913.

² Eschscholtz, System der Acalephen. Berlin, 1829.

with it by Schneider¹ and Vanhöffen.² It has also been taken off the north coast of Ireland and off East Spitzbergen. It was abundantly present in the plankton now being considered, but unfortunately the formalin, in which the material was preserved, produced complete disintegration of the colonies into their constituent parts, and circumstances did not permit of the study of the material while still alive. The form of the *Eudoxia nectocalyces* was, however, excellently preserved, and from these there can be no doubt that the form is identical with that described by Eschscholtz, although the serrations of the edges of the ridges are much less pronounced than in the examples figured by Huxley.³ The larvae of two species of Echinoderms occurred in moderate numbers, one being a *Pluteus* with broad flat arms, probable that of an Ophiuran, and resembling in general form that of *Ophioglypha texturata* figured by Mortensen,⁴ the other a large *Brachiolaria* with a circular adoral ciliated band. Neither of these forms can at present be referred to their adults.

A few examples of an unidentified Annelid larva were also obtained and a considerable number of *Cyphonautes*.

Especially interesting were the Crustacea, inasmuch as they excelled both in number and variety all the other groups. Of the Cladocera, two species were present, *Evadne nordmanni* Lovén and *Podon polyphemoides* Leuck, less abundantly.

Of Copepoda, by far the most abundant was *Acartia longiremis* Lilljeb., this constituting in bulk about one-third of the entire collection. Much less frequent, although still in fair numbers, was a form that I identify as *Centropages hamatus* (Lilljeb.) Giesbrecht, although the armature of the genital segment of the female does not quite correspond with accounts of that form, several rows of short setæ occurring on the lateral portions of the dorsal surface of the segment, (fig. 1) in addition to the strong recurved ventral spine in front of the genital opening. The fifth thoracic feet in both sexes also depart slightly from described conditions, the internal projection of the second joint of the external ramus of the female being apparently longer than usual and denticulate (fig. 2), while in the male the terminal forceps of the right external ramus is somewhat longer and more curved and the spines of the left external ramus more reduced (fig. 3).

¹ K. C. Schneider. Mittheilungen über Siphonophoren, III, Zool. Anzeiger, XXI, 1898.

² E. Vanhöffen. Siphonophoren. Nordisches Plankton, 1906.

³ T. H. Huxley. Oceanic Hydrozoa. London.

⁴ Th. Mortensen. Nordisches Plankton IX.

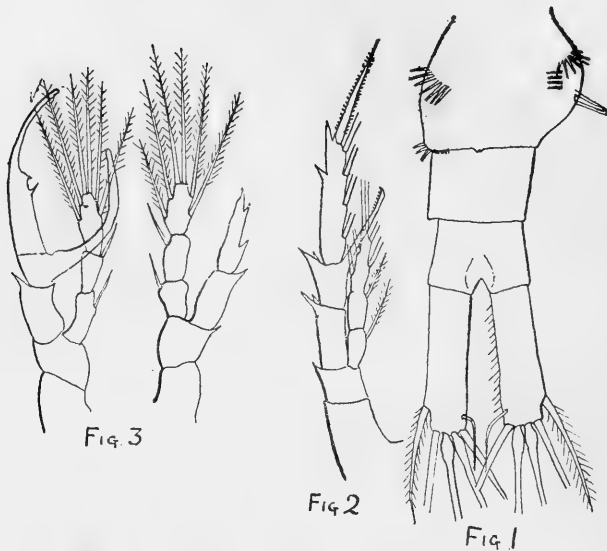


Fig. 1. Urosome of *Centropages hamatus* ♀ from the dorsal surface.
 Fig. 2. Fifth thoracic limb of *Centropages hamatus* ♀
 Fig. 3. Fifth thoracic limbs of *Centropages hamatus* ♂

Corycaeus affinis, n. sp.

This is a small form, the male measuring about 0.83 mm. in length, and it has the anterior division of the body clearly divided into four segments (Ce and Th₁, Th₂, Th₃ and Th₄, while the abdomen consists of two segments, genital and anal, exclusive of the furca. The ventral keel is continued posteriorly into a beak-like prolongation overlapping the first thoracic segment (fig. 4), but the prolongation seems to be much less prominent than in the *rostratus* group, from which the present form also differs in the greater number of abdominal segments. Of these, the furca and anal segment together fall a little short of the length of the genital segment in both sexes, the proportions of the three parts, measured in five examples, being approxi-

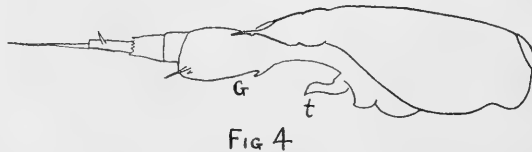


Fig. 4. Side view of *Corycaeus affinis*. *t*—tongue-like prolongation of ventral keel; *G*—genital segment.

mately 10:4:5. The genital segment bears upon its ventral surface at the anterior border a simple, backwardly directed hook, and on each side, in the neighborhood of the genital pore in both sexes there is a simple seta, and medial to this a short spine (fig. 4). The first antennæ are six-jointed, and do not present any distinctive features, but in the second antennæ the terminal seta is much prolonged and decidedly curved and terminates in a blunt extremity (fig. 5). The seta on the second basal joint is a little shorter than that on the first joint and is finely serrate, whereas the latter is simple. The terminal joint of the exopodites of the 1-3 thoracic legs bears three setæ of the usual form on its outer border, and the terminal seta of the second pair is straight and not curved inwards to any appreciable extent. (fig. 6). The endopodite of the fourth pair of thoracic legs is reduced to a small tubercle, which bears two long feathered setæ, and in some examples is clearly divided into two portions. (fig. 7).

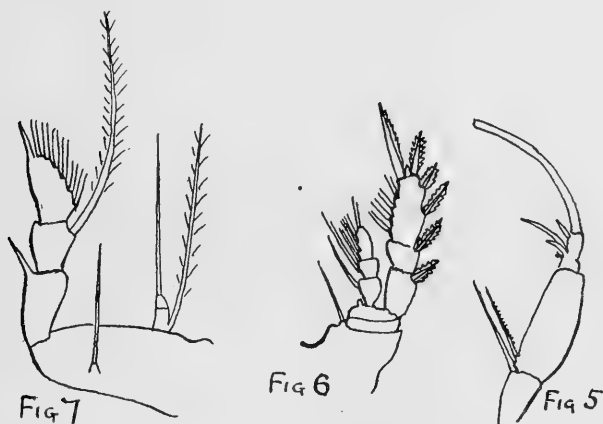


Fig. 5. Second antenna of *Corycaeus affinis* ♂

Fig. 6. Second thoracic limb of *Corycaeus affinis* ♂

Fig. 7. Fourth thoracic limb of *Corycaeus affinis* ♂

The two setae borne by the rudimentary endopodite of the fourth pair of legs indicate a close relationship of this species to *C. tenuis* Giesbr. and *C. lubbockii* Giesbr., both of which are Pacific forms, *tenuis* occurring in the equatorial region and *lubbockii* in the neighborhood of Hongkong.¹ From both these forms, however, *C. affinis*

¹ W. Giesbrecht. Elenco dei Copepodi pelagici raccolti dal tenente di vascello G. Chierchia durante il viaggio della R. Corvetta "Vettor Pisani" negli anni 1882-1884, e dal tenente di vascello F. Orsini nel Mar Rosso, nel 1884. Atti Accad. Lincei Roma. Ser IV. VII. 1891.

differs in the proportions of the urosome, the genital segment being slightly longer and the furcal limbs markedly shorter; thus, in *C. tenuis* the furca is twice and in *C. lubbockii* nearly three times as long as the anal segment, while in *C. affinis* the two segments have almost the same length, the furca being but slightly the longer. Furthermore, in *C. affinis* the furca and anal segment taken together are slightly shorter than the genital segment, while in *tenuis* and *lubbockii* their combined lengths markedly exceed that of the preceding segment. The absence of curvature in the terminal seta of the exopodite of the second pair of thoracic legs also distinguishes *affinis* for both the other species.

I. C. Thompson¹ has recorded the occurrence at Port Townsend of two species of Corycaeus, *C. pellucidus* and *C. obtusus*. The latter is at once distinguishable from *affinis* by its possession of but a single seta on the rudimentary endopodite of the fourth pair of thoracic legs. What the form recorded as *pellucidus* may be is uncertain, since Dana's original description of the species, based mainly on the occurrence of a beak-like prolongation of the ventral keel, does not differentiate it from several other species that show the same peculiarity. Of the later authors who have recorded its occurrence, Lubbock and Thompson simply mention it without any description, and Bate in the 'Challenger' Reports describes a *pellucidus* which may or may not be identical with Dana's form, but at all events differs from *affinis*, markedly in the form of the second antennæ which approximates that shown by *C. rostratus* Claus. Bate, indeed, gives this last name as a synonym of *pellucidus*, but owing to the uncertainty that exists as to what *pellucidus* really is the identification of *rostratus* with it seems unadvisable, and *affinis* must also be regarded as distinct and closely related, apparently, to *tenuis* and *lubbockii*.

A single sample of a fourth Copepodan species was observed, this individual belonging to the Harpacticid genus *Idya*. It seemed to be closely related to, if not identical with, *I. furcata* (Baird) Sars, but its preparation was not quite successful, and the identity, consequently, not fully established.

And finally, mention should be made of a Copepodan metanoplus that occurred in considerable numbers. In details of form this larva resembled so closely that of *Calanus finmarchicus* (*Cetochilus septentrionalis*) described by Grobben² that it must be referred to that species, even although no adults were obtained in this particular collection. They were observed, however, in collections taken at

¹ Proc. Liverpool Biol. Soc. XII, 1898, p. 87.

² C. Grobben. Arb. Zool. Inst. Wien. III. 1881.

other stations along the Vancouver coast and have also been recorded by Thompson as occurring at Port Townsend.

Two Amphipodan species occurred represented by three examples, which my colleague, Dr. A. G. Huntsman, has kindly examined for me. He reports that two of the examples belong to *Hyperoche* sp?, probably closely related to *H. Kroeyeri* Sars, though the exact determination of the species cannot be ascertained until more mature examples are obtained. The other form, represented by a single small female, is probably to be referred to *Parathemisto japonica*.

Of the higher Crustacea, a number of larval forms were obtained, these including a small number of Calyptopis larvæ, to whose parentage no clue was obtained, no adult Schizopods being captured. Of Brachyuran larvæ, a late Megalopa stage was observed and also a number of examples of a Porcellanid Zoea, readily recognizable as such by the exceedingly long rostral spine.

3. The third patch of "brown water" examined was encountered about $3\frac{1}{2}$ miles off Amphitrite Point, Vancouver Island. It contained a much greater variety of protophytic forms than was observed in the collection just described, and in addition to the same species of *Coscinodiscus*, *C. nobilis*, a number of other diatoms occurred, such as *Diatoma elongatum* in considerable quantity and species of *Nitzschia* and *Synedra*. A *Thalassiosira*, perhaps *T. gravis* Gran., was present in small numbers, a *Melosira* in much greater abundance and two species of *Chaetoceras*. One of the forms belonging to this last genus is *C. decipiens* Cleve, characterized by the cells being broadly oblong in front view, the foramina almost slit-like and slightly constricted in the middle, the chromatophores numerous and scattered through the cell, though frequently more or less massed together, and the setæ of each pair both projecting in the sagittal plane. The other species is probably *C. constrictum* Gran., although the absence of examples with spores made the distinction from *C. lacinosum* Schutt a little uncertain. The cells were quadrate in front view, the foramina concave, lanceolate or in some cases almost oval, the sutures very distinct; the chromatophores, two in number, lay close to the valves, and one seta of each pair projected in the sagittal plane while the other was curved so as to lie in the transverse plane. A few examples of *Bacteriastrum furcatum* Shad. were also observed. Two species of *Rhizosolenia*, *R. setigera* Bright and *R. alata* Bright. occurred in small numbers as well as examples of a large *Biddulphia*, possibly a variety of *B. aurita* Lyngb., noticeable on account of the length of the angular processes of the valves, the mound-like projection between them surmounted by two strong filaments of attachment, and the large number of small chromatophores scattered through the cell. Finally a single

example was noted of a form which seems to be referable to the genus *Stephanopyxis*, and there were also two other species, which probably from lack of the necessary literature, it was not possible to identify.

Like the Diatoms, the Dinoflagellates were also well represented as far as variety was concerned, although none of the species occurred in any special abundance. The commonest form was *Prorocentrum micans* Ehr. and others observed were *Dinophysis norvegica* C. and L., *D. laevis*, C and L, with the cytoplasm packed with highly refractive spherical globules, *Peridinium divergens*, and a form which seems to be closely related to, if not identical with Bergh's *Protoperidinium pellucidum*. *Ceratium fusus* was not uncommon, and a single example of *C. tripos* was seen, belonging to a variety in which the posterior horns are very short and directed almost straight outwards, without any noticeable curvature.

Of higher forms, mention may be made of an Anthomedusan that was present in considerable numbers, and represents a hitherto unknown species. A description of it has been drawn up by Dr. H. B. Bigelow and will appear as a separate contribution in these Proceedings.

The crustacea were less abundantly represented than in the collection from Esperanza Inlet, but two forms of Cladocera were again present, *Evadne nordmanni* and a Podon, which in this case, however, was *P. leuckartii*. Of the Copepoda, the most abundant form was again *Acartia longiremis*, but it is interesting to note that a few individuals of *Calanus finmarchicus* (Gunner) Boeck were also observed. *Paracalanus parvus* Claus was represented by numerous examples and occasional individuals of *Centropages hamatus*, *Corycaeus affinis* and a form which apparently represents a new genus and species belonging to the family Pontellidae.

Paralabidocera n. g.

Cephalic region provided with lateral hooks and with two strong triangular rostral processes. Dorsal eyes well developed, each with a single cuticular lens, somewhat larger in the male than in the female. Ventral eye present, but destitute of a cuticular lens. Last thoracic segment not fused with the preceding one, its lateral lobes hardly pointed in the female, but markedly so on the right side in the male. Abdominal region consisting of three segments in the female and four in the male, the genital segment being only very slightly asymmetrical, as are also the furcal rami in the male. Anterior antennæ reaching to beyond the last thoracic segment, 25-jointed, several of the joints being, however, fused in the female so that the total number cannot

be counted; in the male the right antenna is slightly dilated in its middle part but does not bear any denticulate grasping lamellæ. Posterior antennæ with the inner ramus nearly or quite as long as the outer one, which is confluent with the second basal joint.

Masticatory portion of the mandible with 5 teeth, of which the 3rd and fourth are bicuspid, the others simple. The outer ramus of the 1st-4th thoracic limbs 3-jointed, the inner ramus of the 1st limb 3-jointed and that of the 2nd and fourth limbs 2-jointed. Fifth limb in the female almost symmetrical, with both inner and outer rami, each consisting of a single joint; in the male asymmetrical, the right one being larger than the left, with no inner ramus and a simple single-jointed outer ramus.

Paralabidocera amphitrites n. sp.

The individuals upon which this species is founded were three in number two females and one male. Many additional examples were found, which from the general form of the body, the arrangement of the eyes and other particulars were evidently identical, but immature, and not presenting in all respects the characters that may be regarded as adult. Neither of the presumably adult females carried ova or spermatophores, and there is consequently a possibility that even they had not quite reached the adult stage. This possibility, however, seems so slight that it may be disregarded.

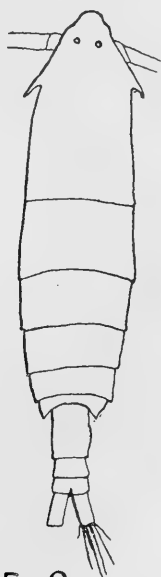


FIG 8

Fig. 8. *Paralabidocera amphitrites*, from dorsal surface.

The length of the male is 2.53 mm. The rostral processes are well developed and form a pair of triangular processes, attached to the rostral region by a broad flattened base, and terminating in a sharply pointed apex. The lateral hooks of the cephalic region are well-developed, resembling those found in the genus *Pontella* (fig. 8).

In the female, the cuticular lenses of the dorsal eyes are small and are separate from one another by about three times their diameter. The ventral eye is well-developed, but lacks a lens. The anterior antennæ extend backwards to the level of the second abdominal segment and are probably 25-jointed, though so much fusion has occurred between the more proximal joints that not more than 22 could be distinguished; the 24th and 25th were fused, the latter being greatly reduced in size. The posterior antennæ have the general Pontellid form, but are characterized by the large size of the outer ramus, which is quite as long as the inner one; the latter is almost completely fused with the distal basal joint, a faint line on the inner surface being the only indication of a separation. The mandible (fig. 9) has the distal basal limb decidedly bellied out upon its outer

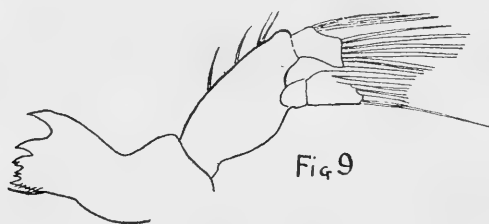


Fig. 9. Mandible of *Paralabidocera amphitrites* ♀

side, and the terminal portion of the outer ramus is bowed outwards so that the inner surface of the indistinctly separated joints look distally as well as inwards; the masticatory portion bears only five teeth, of which the first and second are widely separated and simple, while the remaining three are more closely set and the third and fourth bicuspid; two rows of small setæ occur at the base of the fifth tooth and a longer seta arises from the posterior border a little lateral to the base of the fifth tooth. The maxilla resembles closely that figured by Giesbrecht for *Pontella lobiancoi*¹, the most noticeable differences being that the proximal group of setæ on the fused $B_1 + Ri_1 + Ri_2$ consists of three instead of four setæ. The two maxillipeds resemble so closely those figured by Giesbrecht for *Labidocera wollastoni*² as to need no further description.

¹ W. Giesbrecht, Copepoda. Fauna n. Flora Golfes von Neapel. XIX. 1892. pl. XXIV, fig. 22.

² L.c. Pl. XXIII, figs. 10 and 20.

The last thoracic segment is narrow but quite distinct from the preceding one; its lateral lobes symmetrical and terminating in an acute angle, but not prolonged into well-marked expansions (fig. 8). The outer rami of the 1st-4th thoracic limbs are 3-jointed, the inner ramus of the 1st limb is 3-jointed (fig. 10), but those of the 2nd-4th limb are 2-jointed. The 5th limb (fig. 11) is symmetrical on the two sides, the proximal basal joints are united in the medial line and the

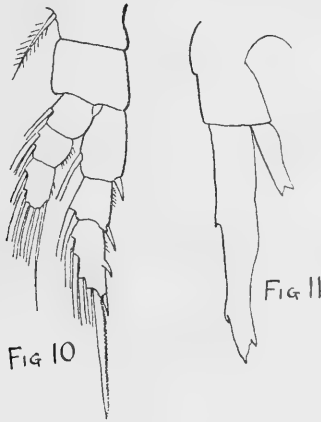


Fig. 10. First thoracic limb of *Paralabidocera amphitrites* ♀
 Fig. 11. Fifth thoracic limb of *Paralabidocera amphitrites* ♀

distal basal bears upon its posterior surface a single feathered seta attached about half way between the proximal and distal borders and extending only a short distance beyond the latter. The outer ramus is single-jointed and is almost straight; it terminates in a pointed projection, a smaller tooth occurring at the inner side of its base, while two small teeth are borne upon the outer border. The inner ramus is also single-jointed and articulates with the distal basal joint; it is also almost straight, is bellied out on its inner border proximally, terminates into two short teeth and is a little less than one-third the length of the outer ramus.

Male.—The head region of the male resembles that of the female except that the lenses of the dorsal eyes are considerably larger. The left first antenna is very similar to that of the female, but the right one (fig. 12) is considerably modified. The basal joints are broader and there is no fusion of joints, except a partial fusion of 1st and 2nd, so that all the twenty-five joints of which the limb is composed can be readily distinguished. The 3rd-8th joints are narrow, and each bears three aesthetascs (all of which are not shown in the figure): a

constriction occurs between the 8th and 9th joints and the succeeding joints become gradually longer and up to about the 14th and 15th gradually wider also, the width of the limb at this region being about twice what it was at the constriction between the 8th and 9th joints. The 18th and 19th joints are at least twice the length of the 17th and the 19th bears upon its outer distal border a spine-like prolongation almost as long as the 20th joint; the middle dilatation may be regarded as ceasing with the 19th joint, and beyond this there are six joints forming the terminal portion of the limb, the last of them, the 25th, being very small, but distinctly separated from the preceding one. There is no angulation and no denticulate grasping lamellæ were present on any of the joints.

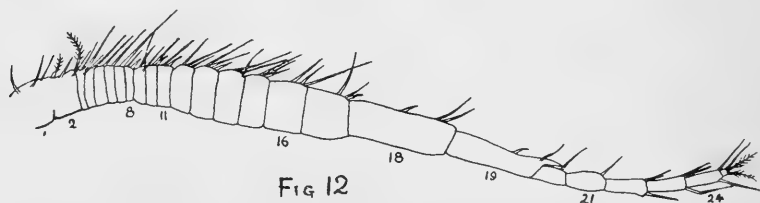


Fig. 12. Right first antenna of *Paralahidocera amphitrites* ♂

The last thoracic segment is asymmetrical, its left lateral lobe resembling that of the female, while on the right side it is prolonged backwards as a pointed process that reaches to about the middle of the first abdominal segment. The fifth thoracic limbs (fig. 13) are also asymmetrical to the extent that one is longer than the other and terminates in three sharp points, while the other has only two smaller terminal points. Both consist of but one single-jointed ramus and there is no indication of the chelate condition occurring in Labidocera.

The abdomen consists of four segments, (fig. 14) the first being slightly asymmetrical. The furcal rami are symmetrical and setose on their medial borders; their length is twice their greatest breadth.

4. The fourth patch of "brown water" examined, was encountered off the Escalante Rocks, Nootka Sound, Vancouver Island, and its constituents are for the most part identical with forms described from patches 3 and 2. *Coscinodiscus nobilis* was rare, *Ceratium fusus* frequent, and *C. furca* occasional, but there was by no means so great a variety of protophytic forms as was seen in the other patches. The medusa, *Rathkea blumenbachii*, was again present in considerable numbers, and *Diphyes appendiculata* was represented by a few examples as was also the Brachiolarian larva observed in patch 2. The Crustacea, as usual, were well represented; *Evadne Nordmanni* was observed and more rarely Podon (species undetermined). Of the Copepoda,



FIG 13

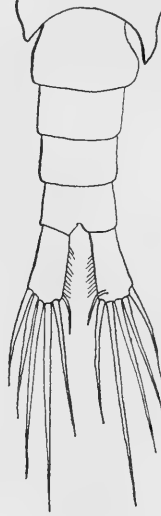


FIG 14

Fig. 13. Fifth thoracic limbs of *Paralabidocera amphitrites* ♂

Fig. 14. Urosome of *Paralabidocera amphitrites* ♂

the most abundant species was again *Acartia longiremis* and with it was associated less abundantly *Calanus finmarchicus*, *Paracalanus parvus*, *Centropages hamatus*, and *Corycaeus affinis*. Barnacle larvae were also frequent and Schizopod larvae occasional, while a couple of examples of an undetermined Brachyuran were also captured.

5. For comparison with the above records, an account may be given of two surface gatherings taken during the same voyage, but from water that showed no signs of colouration, in which, that is to say, there was no special concentration of the plankton. The first of these was a gathering taken off Rose Spit at the northern end of the Queen Charlotte Islands, August 25th, 1912. Its most abundant constituents were diatoms, a species of *Nitzschia* being particularly frequent, far surpassing any other form in numbers. With it, scattered representatives of other genera occurred, those recognized being *Diatoma elongatum*, *Asterionella*, two species of *Coscinodiscus*, a *Biddulphia* (probably *B. mobiliensis*), a *Melosira*, *Chaetoceras decipiens* and *Rhizosolenia alata*. Three species of Dinoflagellates were noted, all belonging to the genus *Ceratium*, *C. fusus*, *C. tripos*, and *C. furca*; the *fuscus* being the most frequent. Rare examples of the Silicoflagellate *Distephanus speculum* were seen, and also of the Tintinnode, *Cytarocylis denticulata* C and L. A single example of the Brachiolarian

mentioned as occurring in the second and fourth patches of "brown water" was noted and also a few Cyphonautes and a fair number of *Oikopleura dioica*.

Of Crustacean forms, there were observed a single individual of Podon, whose species was undetermined, and the following Copepoda, none of which were in any great numbers; *Pseudocalanus elongatus* Boeck, the form identified with *Centropages hamatus*, *Tortanus discaudatus* Thomps. and Scott, *Acartia longiremis* and *Oithona similis* Claus. Numerous Copepod nauplii and immature forms were also present, as well as occasional barnacle larvæ and numerous ova that were taken to be of some Schizopodan form. A late Peneid metazoea was also seen and two young Brachyurans which were not identified. In this gathering the only teleostean ova obtained were present; they were few in number and could not be identified.

6. The second gathering that may be used for comparison was taken eight miles off Hudson Bay Passage, Dixon Entrance, B. C., August 25th, 1912. In marked contrast to gathering 5, this one was almost destitute of diatoms, only rare examples being noticed of a form which seemed to be a Rhizosolenia, but which could not be definitely identified. Flagellate and Protozoan forms were also almost wanting, an occasional Noctiluca being the only one observed. On the other hand, a broad armed Pluteus similar to that mentioned as occurring in gathering 2 was quite frequent and a single example of an Auricularia was also seen. An occasional Cyphonautes occurred and also a few examples of *Oikopleura dioica*.

Of Crustacea in addition to a small number of Cirrhipede larvae and an occasional Evadne and Podon, mature individuals of the following species of Copepoda were observed; *Pseudocalanus elongatus*, *Centropages hamatus*, *Paralabidocera amphitrites*, *Tortanus discaudatus*, *Acartia longiremis*, and *Oithona similis*. The most abundant constituents of the gathering, however, were ova of two kinds; one variety was the same as those ova obtained in gathering 5 and identified as belonging to some Schizopodan form, while the second variety, less numerously represented, was only about half the size of the other, and possessed a greatly corrugated chorion.

From these observations fragmentary though they be, it would seem that the "brown water" plankton does not, as a rule, differ qualitatively from that distributed in a more diffuse manner in the neighboring areas. The brown patches merely represent aggregations of the ordinary plankton, produced perhaps by the local action

of winds and currents, an approach to a monotonic condition being indication possibly of a reproductive rhythm such as that which produces the vernal maximum of plankton protophytes.

The similarity of the planktonic constituents of British Columbian waters to those of the North Atlantic is very striking, the great majority of the forms being specifically identical with those occurring in the latter area. This is probably to be explained on the basis of a circumpolar distribution of the majority of the forms concerned, although the possibility should not be neglected that in the case of some forms the similarity may be due to a former circumpolar distribution under different climatic conditions. In other words, it is possible that certain forms may occur upon both the eastern and western coasts of Canada, between certain latitudes, and not on the intervening northern coasts, being isolated detachments of species which in earlier times possessed a circumpolar distribution. There are some indications that such a condition occurs, but until a thorough knowledge of the zoology of our arctic waters is obtained, they can be regarded only as pointing to a possibility.

Halimedusa, a New Genus of Anthomedusæ

By HENRY B. BIGELOW

Presented by J. PLAYFAIR McMURRICH, F.R.S.C.

(Read May Meeting, 1916)

Halimedusa typus, gen. nov., sp. nov.

Three specimens, taken off Amphitrite Point, Vancouver I.; surface, September 12, 1914; respectively 16, 16 and 10 mm. high. The specimen selected as the type (Pl. I., fig. 1) is 16 mm. high, by 13 mm. in diameter, the bell thick walled, especially at the apex, its cavity about $\frac{2}{3}$ of the bell height.

The manubrium is situated on a broad, low, peduncle (fig. 2) which, anatomically, is a simple gelatinous prominence, without any trace of the peculiar vacuolated structure which characterizes the genus *Turritopsis*. The radial and circular canals are narrow and smooth walled (fig. 3): i.e., without any of the diverticula so common among *Pandeids*. (1909, Hartlaub 1913).

The manubrium and gonads, and the tentacles, are the most interesting and characteristic features of this new genus. In both the large specimens the manubrium is divisible into gastric and labial portions. The latter (fig. 8), is cruciform in cross section, resulting in four apparent lips. But the oral margin is entire, i.e., not subdivided or incised, the lips being merely the result of the longitudinal radial folding of the oral end of the manubrium as a whole, thus not comparable to the lip lobes of many *Leptomedusæ*. The entire oral margin is closely studded with a single row of small, roughly spherical, nematocyst knobs (fig. 6), which are either immediately sessile on the actual margin of the lip, or provided with very short stalks, according to their state of contraction.

The relatively large gastric portion of the manubrium is likewise strongly cruciform in cross section: and its four radial folds clasp the peduncle, like so many expanded sinuses, to merge suddenly, at the base of the latter, into the narrow radial canals.

In the type specimen the lower part of the manubrium is irregularly folded and twisted transversely (fig. 2): but in the other adult individual it is smooth except for the primary radial plications (fig. 8).

At first sight the basal part of the four radial gastric folds might

be taken for enlarged bases of the radial canals, because of their separate extension upward over the oral surface of the peduncle. And it is possible that they should be so interpreted. Since there is no fundamental distinction, other than gross anatomy, between canal and manubrium, this question can not be settled from the adult state; and unfortunately the manubrium is lacking in the smaller specimen.

But, in any case, there is nothing, in *Halimedusa*, reminiscent of the so called "mesenteries" of Pandeids, e.g., *Leuckartiara* (Hartlaub, 1913).

The sexual products (both large specimens are apparently males) are evenly developed over the whole interradial surfaces of the manubrium, including its four extensions over the peduncle, but the labial portion is bare of them (fig. 8). And there are no localized sexual ridges, or thickenings. In one specimen, it is true, the gastric wall is transversely folded (fig. 2) as noted above. But inasmuch as the folds are not alike in any two quadrants, and do not even follow any general plan, and since nothing of the sort is to be seen in the other specimen (fig. 8) equally advanced in sexual development, they are clearly the result of contraction, like the similar folds which so often characterize preserved specimens of *Heterotiara anonyma* (1913, p. 26). They are not comparable to the gonad folds of the Pandeidae (Maas, 1904, Bigelow 1909, Hartlaub 1913). Surface views indicate (fig. 8) that the sexual tissue is discontinuous along a narrow band in each perradius, as might be expected.

The question whether the gonads are restricted to the walls of the manubrium, as in most Anthomedusae, or whether they extend to the basal parts of the radial canals, as in the Williidae (Browne, 1896, Bigelow, 1909, Hartlaub 1914), depends, of course, on how we interpret the gastric lobes which extend over the peduncle. In the adult state these latter apparently belong to the manubrium, by the lack of any apparent demarcation, and especially by their voluminousness. But the possibility of the other interpretation, i.e., that they are in reality the bases of the radial canals, secondarily enlarged during the progress of the growth of the Medusa, makes me hesitate to postulate that the development of sexual products is sharply limited to the walls of the manubrium.

Tentacles. The tentacles are divisible into two portions, the basal bulb and the terminal filament. Both are hollow (fig. 7.), the latter smooth walled, without any rings or knobs; and the tip is simple, without swelling, knob or other nematocyst structure (fig. 3). The basal bulbs are circular in abaxial view and swollen (fig. 4): and, as side views show (fig. 5), they are situated at various levels above the

margin, according to the ages of the tentacles. No matter how much elevated the tentacle bases are above the margin, they are, of course, permanently connected with the latter, and with the circular canal as is, indeed, the universal rule. And in this case this connection comprises a strand of thickened ectoderm leading from tentacle bulb to margin, in addition to the entodermal roots, instead of being reduced to the latter alone as in the Bythotiaridæ (e.g. *Calycopsis* and *Heterotiar*, 1909, 1913). Each basal bulb, old or young, bears a prominent ocellus, consisting of yellowish red pigment ring, with enclosed clear area, on its *outer, abaxial* side (figs. 4 and 5): since the abaxial location of these is important, as pointed out below, it is fortunate that it is as easily established on the photographs as on the actual specimens.

In the type specimen there are 10–11 tentacles in each quadrant, i.e.; a total, with the four radials, of about fifty: in the other large specimen there are forty-six in all; in the smallest example, forty-five.

The arrangement of the tentacles is so unusual as to demand special notice. In all the quadrants of all three specimens the inter- and subradial tentacles are closely grouped together, and separated from the radial tentacle on either hand, by a considerable gap (fig 3). In the smallest specimen, which, of the three, shows the arrangement of the tentacles most clearly, the numbers per quadrant (exclusive of radials) are 10, 10, 10, 11. The radial tentacles are largest, and located highest up on the exumbrella: next in size, and in distance from the margin, are the inter-radials (fig. 9). In the one quadrant in which the tentacles (11 in number) are symmetrical, the latter is flanked on either hand by a very small tentacle located close to the bell-margin (fig. 9). Next to this, again, in either half of the quadrant, is a tentacle only slightly smaller than the interr radial, and nearly as far from the margin: and this is flanked, in its turn, by a series of three tentacles, successively smaller and smaller (younger and younger) as the per-radius is approached.

The tentacles are arranged on fundamentally this same plan on all the quadrants of all three specimens. But in the large specimens the interr radials are as large, and located as high up on the exumbrella, as the radials, and the subradials, flanking the interr radials, are irregular in number and location, according as more or less have been interpolated. However, it is clear that the fundamental plan of succession, in all cases, is first, radial tentacle, then interr radial, followed, on either side of the latter by a successive series progressing toward the perradius. But interpolation of other tentacles then takes place on either side of the interr radials, and irregularly between the other

pre-existing tentacles, until the fundamental plan is more or less obscured at maturity.

There are no otocysts.

Color. After preservation in formalin the manubrium and tentacular bulbs are yellowish, the ocelli yellowish red. In life the bell is almost perfectly transparent and colorless, the tentacles are cream white and the ocelli purple-black; the gonads are in some cases faintly greenish, in others white or salmon-color.

Halimedusa is obviously a highly specialized *Anthomedusa*, but its systematic relationships are not altogether clear, for we find combined in it the characters of *Pandeidæ* (1909, 1913), *Cytæidæ*¹ (1909) and perhaps *Williidæ*. The general appearance of the medusa, particularly its simple gelatinous peduncle, and oral armature of sessile knobs, find such a close counterpart in the *Cytæid* genus *Oceania* (Mayer, 1910) that at first I thought I was dealing with a species of that genus. But in *Oceania*, as in all *Cytæidæ* and *Bougainvilleidæ*, the tentacles are solid (1909, Hartlaub 1911, Mayer 1910) and the ocelli on their inner, axial sides (Mayer 1910, Hartlaub 1911), whereas in *Halimedusa* they are hollow with abaxial ocelli, in both which respects they agree with the *Pandeidæ*. But no true *Pandeid*, (excluding the *Bythotiaridæ* which I believe deserve a separate family), has oral knobs or tentacles. And though one species of *Calycopsis* has similar structures (1913), the general organization of that genus, and its allies, particularly with respect to the manubrium, gonads and tentacles, differs too much from that of *Halimedusa* to allow of the idea that they are closely related. Finally, the structure of the manubrium and gonads of our new genus, particularly their four radial extensions over the peduncle, and the possibility that the sexual products include the bases of the radial canals, suggests the *Williidæ*, from which family, however, it is separated by the simple canals, as well as by the presence of ocelli, and labial knobs.

We have here one of those cases, so commonly confronting the student of *Medusæ*, where a new genus contravenes all family lines, as previously laid down, though it is obviously an off shoot from one or other family previously recognized, not the representative of a new group.

The hollow tentacles, and particularly their hollow basal bulbs, show that *Halimedusa* is most closely related to the *Pandeidæ* in spite of its superficial resemblance to some *Cytæidæ*, e.g., *Oceania* and *Turritopsis*. And the only important feature in which it differs

¹ Hartlaub, 1911, includes *Cytæidæ* and *Bougainvilleidæ* in one family: and no doubt their members are more closely allied to one another than to the *Pandeidæ* or *Williidæ*. But the distinctions between them seem to me to warrant the retention of both families (1909, 1913).

from the Pandeidæ, the presence of labial knobs, is certainly of far less phylogenetic importance than the structure of the tentacles, because in Calycopsis (an offshoot no doubt, of the Pandeidæ) one species has them, others lack them (1913, Hartlaub, 1913).

The abaxial ocelli, too, further suggest a Pandeid relationship, for as a rule the ocelli of Cytæidæ and Bougainvilleidæ are axial, if present, though this is not invariably the case (Maas, 1909, has described them as abaxial in his *Turritopsis Pacifica*¹).

BIBLIOGRAPHY

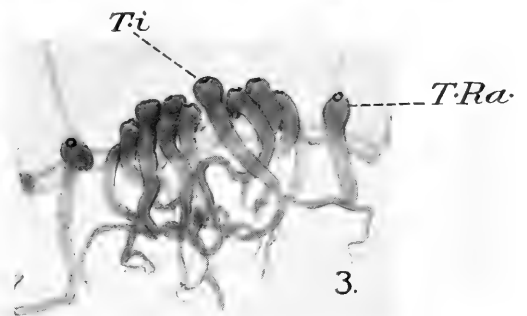
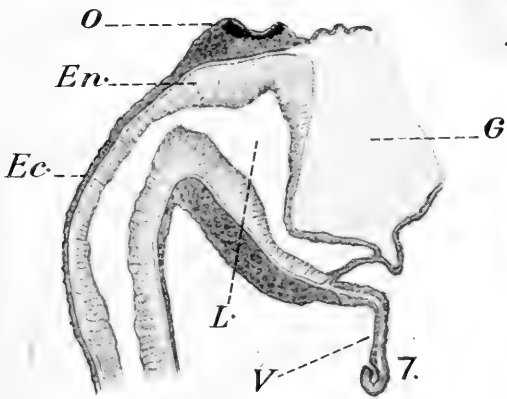
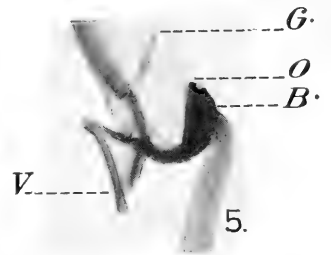
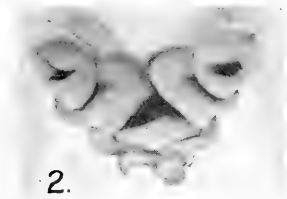
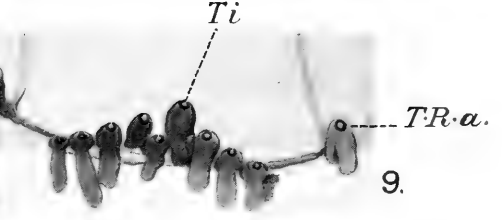
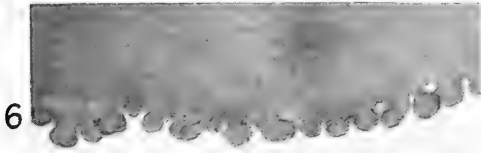
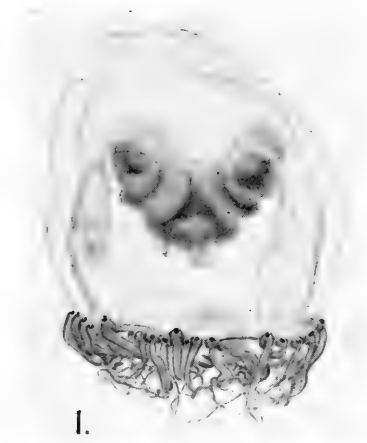
- Bigelow, H. B., 1909. Reports on the Scientific results of the Expedition to the Eastern Tropical Pacific, etc., XVI. The Medusae. Mem. Mus. Comp. Zool. Vol. 37, pp. 243, 48 pls.
- Bigelow, H. B., 1913. Medusae and Siphonophorae collected by the U. S. Fisheries Steamer "Albatross" in the North Western Pacific, 1906. Proc. U. S. Nat. Mus., Vol. 44, p. 1-119, pl. 1-6.
- Browne, E. T., 1896. On British Hydroids and Medusae. Proc. Zool. Soc. London, p. 459-500, pl. 16, 17.
- Hartlaub, C., 1911. Craspedote Medusen. 1 theil, 2 lief. Margelidae. Nordisches Plankton, XII, p. 137-235.
- Hartlaub, C., 1913. Craspedote Medusen, 1 theil, 3 lief. Tiaridae. Nordisches Plankton, XII, p. 237-363.
- Hartlaub, C., 1914. Craspedote Medusen, 1 theil, 4 lief. Williadae. Nordisches Plankton, XII, p. 365-380.
- Maas, O., 1904. Méduses provenant des Campagnes des Yachts Hironde et Princess Alice (1886-1903). Résultats des Camp. Sci. etc. par Albert 1^{er} Prince Souverain de Monaco . . . 28, 71pp., 6 pls.
- Maas, O., 1909. Japanische Medusen. Beiträge zur Naturgeschichte Ostasiens. . . herausg. von Dr. F. Doflein. Abh. K. Bayer. Akad. Wiss. 1 suppl. vol., 8 abth., 52pp., 3 pls.
- Mayer, A. G., 1910. Medusae of the world. 3 vols., 734 pp. 76 pls. Carnegie Inst., Washington, Publ. No. 109.

¹ I have discussed this point elsewhere, 1913, p. 7.

EXPLANATION OF PLATE I

Figs. 1-6 from Type specimen.
Figs. 1-6, and 8-9, from photographs.

- Fig. 1. Side view of Type.
- Fig. 2. Side view of Manubrium with bell wall dissected away.
- Fig. 3. One quadrant of the margin. T. ra., radial tentacle. T. i., interradial tentacle.
- Fig. 4. Base of radial tentacle of Type, abaxial view. O, ocellus.
- Fig. 5. Side view of base of radial tentacle, B. basal bulb; O, ocellus; v, velum; g, gelatinous substance of the bell.
- Fig. 6. Portion of margin of lip.
- Fig. 7. Longitudinal section of base of tentacle.
- Fig. 8. Peduncle and manubrium of specimen 17mm. high, to show lips, and radial folds.
- Fig. 9. Quadrant of margin of specimen 10mm. high to show arrangement of tentacles. T. ra, radial tentacle. T.i., interradial tentacle.



Transactions of The Royal Society of Canada

SECTION IV

SERIES III

DECEMBER 1916

VOL. X

On the Development of Æquorea Forskalea.

By C. McLEAN FRASER.

(Read May Meeting, 1916).

During the months of April and May specimens of the medusa, *Æquorea forskalea* Peron et Le Sueur, in various stages of development are found in large numbers in Departure Bay and in the neighboring waters. By getting a large series of them it has been possible to trace the order of development of the radial canals, tentacles, lithocysts, excretory pores and lip folds.

The youngest medusa yet obtained had four perradial canals complete to the circumference and four interradial canals started. The medusa was about 2 mm. in diameter. What size it is when it is liberated or how far development is gone at that time it is impossible to say, although but little time must have elapsed in the interval. If the *Campanulina* reported from this region is really the hydroid of *Æquorea*, and there is no reason to doubt it as no other *Campanulina* has been found near by, it may be some time before the gap will be filled. Since it was first reported from the San Juan Archipelago,¹ it was found on some small green algæ, near Round island, Dodds Narrows, on June 18, 1913,² and not again until April 5, 1916, in a location where one should scarcely expect to find a hydroid of any kind, viz., on the walking legs of the commensal crab, *Pinnixa*, taken from the mantle cavity of a horse clam, *Schizothærus nuttalli*. It was not alone however, as there were small specimens of *Clytia edwardsi* growing on the same crab. The specimens found here were at much the same stage as the previous specimens, showing no signs of developing medusa-buds. As no specimen yet found had attained a height of 1 mm. it can readily be seen that it is a hopeless task to proceed to look for others as it would be a difficult matter to find them even if one knew where to look. The hydroids that produce these medusæ must be very plentiful as the medusæ appear in such large numbers

¹ West Coast Hydroids, 1911, p. 43.

² Hydroids of the Vancouver Island Region, 1914, p. 157.

but unless some suitable colonies appear accidentally it may be long enough before the first stage in the medusa development can be described.

When the medusa has four perradial canals, or canals of the first series, and four interr radial canals, or canals of the second series, complete to the circumference, there are at the same time eight tentacles, four perradial, being well developed and the other four just beginning, but slightly past the bulb stage. Besides these there are the rudiments of eight other bulbs. There are eight lithocysts well developed, one at each side of each perradial tentacle bulb, and eight others in process of development in a corresponding position relative to the interr radial bulbs. The mouth is distinctly four-lipped.

By the time the four interr radial canals are complete, the beginnings of some or all of the adradial canals, or canals of the third series, may generally be seen. The eight tentacles are now well developed. Eight tentacle bulbs, corresponding to the eight primary adradials, have grown much larger and eight more bulbs are beginning, one between each perradial and its nearest adradial. The second set of eight lithocysts is now quite distinct but there is no sign of any for the adradial bulbs. The mouth is still four-lipped.

When the medusa has reached a diameter of 7 mm. the primary adradial canals are complete to the circumference and the secondary adradials, or canals of the fourth series, have started to develop. The first of them appear between the perradials and the adradials and these may be of considerable length before those between the interr radials and the adradials make a start. The adradial tentacle bulbs are all supplied with tentacles, the bulbs between the perradials and adradials have increased in size but have not yet developed tentacles and the bulbs between the interr radials and the adradials are visible but still small. As the adradial tentacles are developed, a pair of lithocysts, one at each side of the base, become apparent but none are yet visible for the next set of developing bulbs. The mouth has now become octagonal instead of four-lipped, as each lobe has now become distinctly notched.

A 10-mm. medusa may have all of the canals of the fourth series complete but before the last of them reach the circumference, the next series of canals, the fifth, has started. The first canals of the fifth series appear between the perradials and the secondary adradials adjacent to them. The tentacle bulbs of the fourth series have not developed tentacles although those nearest the perradials are of large size, those next to the interr radials being somewhat less so, while those for the fifth series nearest the perradials are just beginning to show. Each of the tentacle bulbs of the fourth series is now

provided with a lithocyst at each side of the base. The eight lobes of the lips are each divided into four parts by slight indentations.

By the time the diameter of 12 mm. is reached, the first eight radial canals of the fifth series, viz., those adjacent to the perradials, are complete and some of the next eight, viz., those adjacent to the interradians, have made a beginning. Tentacles have appeared on the bulbs of the fourth series adjacent to the perradials and the bulbs adjacent to the interradians are of large size. The bulbs of the fifth series have started to develop. The pairs of lithocysts for all of the bulbs of the fourth series are present. The mouth has changed very little.

At 16 mm. the second eight canals of the fifth series, viz., those adjacent to the interradians are complete and rudiments of some of the remaining sixteen, those adjacent to the primary adradials, are noticeable. All or nearly all of the tentacle bulbs of the fourth series have tentacles and all or nearly all of the bulbs for the fifth series have put in an appearance. There are no lithocysts adjacent to these yet. The lips appear as sixteen lobes, each notched slightly.

In the majority of specimens the development becomes more irregular as it proceeds but one specimen, 27 mm. in diameter, was found, developed so symmetrically that all of the canals of the fifth series were present in whole or in part and none of the sixth series had started. As there were thirty-two in the fifth series, the whole number was exactly sixty-four. All of the tentacle bulbs of the fourth series have tentacles but none of the fifth series although all of the bulbs of this series are more or less developed and each of them has a pair of lithocysts at the base. The lithocysts, therefore, now number one hundred and twenty-eight. The lips consist of the sixteen lobes as in the preceding but instead of the single notch in each, one or two others give the lobe a more or less wavy appearance.

Usually the irregularity is such that before some of the latest of the fifth series of canals have completed or even in some cases before they have started to form, some of the sixth series may have started. These come in very slowly and in no case have I seen the set complete, although many medusæ up to 65 mm. in diameter were examined. In the adult medusa, 75 or 80 canals seem to be about the upper limit. In the development of the canals of the sixth series, the same order is followed as in the fifth series, i.e., those adjacent to the perradials appear first, then those adjacent to the interradians, those adjacent to the primary adradials and those adjacent to the canals of the fourth series. Although in very few cases have I seen any of the last of these developed. The tentacle bulbs of the fifth series may all develop tentacles although in few cases is the set entirely complete. Tentacle

bulbs develop for the sixth series but apparently none of them get far enough to develop tentacles although some of them may get far enough to have the lithocysts develop at the base. The mouth remains sixteen-lobed but each lobe becomes serrated so that at times these cannot be made out readily. Some of the indentations may be deep enough to give the appearance of extra lobes but even in such cases the number of lobes so formed is never more than half the number of the radial canals. The diameter of the stomach varies from one-half to one-third the diameter of the umbrella.

The gonads begin to develop along some of the larger radial canals about the time the fifth series is nearing completion but the development is not rapid. Until the medusa reaches a diameter of about 60 mm. they are not very noticeable. They appear on all of the radial canals and become bi-lamellar.

The excretory pores are not very noticeable in the early stages of development but by the time the tentacle bulb is large enough to develop a tentacle the excretory pore is distinctly evident. In the adult there is usually a pore to each developed tentacle bulb and occasionally on the large bulbs there may be two pores present.

SUMMARY.

After the first three series of radial canals are developed in the medusa, *Æquorea*, there is liable to be much irregularity but the development follows a definite plan more or less closely. The first series consists of four perradials; the second, four interradians; the third, eight primary adradials; the fourth, sixteen secondary adradials, of which the first eight are adjacent to the perradials, the second eight adjacent to the interradians; the fifth, thirty-two tertiary adradials, of which the first eight are adjacent to the perradials, the second eight adjacent to the interradians and the remaining sixteen adjacent to the primary adradials. The sixth series seldom becomes complete but the development as far as it goes occurs in the same order as the fifth series.

The tentacles follow the same order as the radial canals. In general the rudiment of the tentacle bulb appears before the beginning of the corresponding radial canal. By the time the canal reaches the circumference the bulb is quite large but the tentacle has not started to develop and may not appear for some time after. While the bulb is quite small a lithocyst develops at one side of the base and shortly afterwards the one on the other side, or they may appear simultaneously. There are thus two lithocysts to each well developed tentacle bulb.

The folds of the lips develop somewhat irregularly but somewhat after the manner of the canals and tentacles although there are never more than half as many lobes as there are radial canals.

An excretory pore appears at the base of each developed tentacle bulb and occasionally on large bulbs there may be two pores.

The rudiments of the gonads appear along the largest of the radial canals about the time the fifth series is complete. They develop slowly but finally appear along all of the radial canals. When fully developed they are bi-lamellar.

EXPLANATION OF FIGURES.

These figures are drawn to show diagrammatically the order in which the radial canals are developed in *Æquorea*. The introduction of the new canals is made more pronounced by not making any allowance for a difference in size of the medusa. There is one figure for each of the definite stages to the end of the fifth series.

The perradials are numbered 1, the interradians 2, the primary adradials 3, the first eight of the fourth series 4a, the second eight 4b, the first eight of the fifth series 5a, the second eight 5b, the remaining sixteen 5c.

Fig. 1 shows the 4 perradials.

Fig. 2 shows figure 1 with 4 interradians added.

Fig. 3 shows figure 2 with 8 primary adradials added.

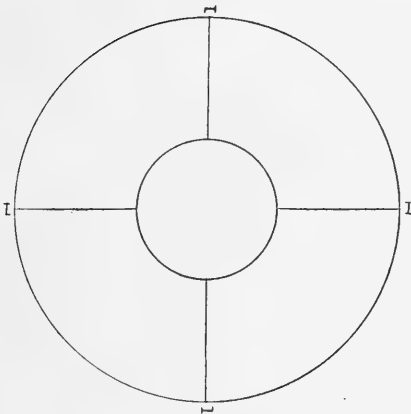
Fig. 4 shows figure 3 with the first 8 of the fourth series added.

Fig. 5 shows figure 4 with the second 8 of the fourth series added.

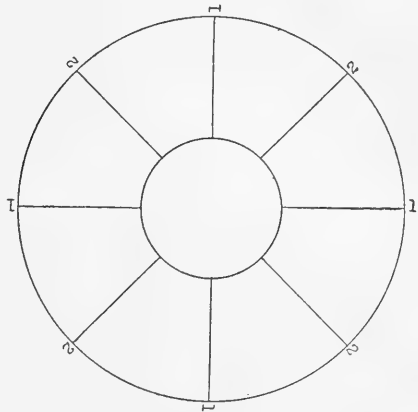
Fig. 6 shows figure 5 with the first 8 of the fifth series added.

Fig. 7 shows figure 6 with the second 8 of the fifth series added.

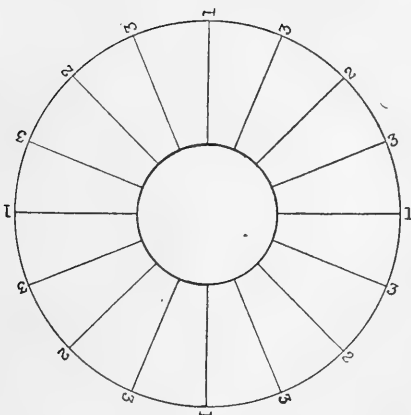
Fig. 8 shows figure 7 with the remainder of the fifth series added.



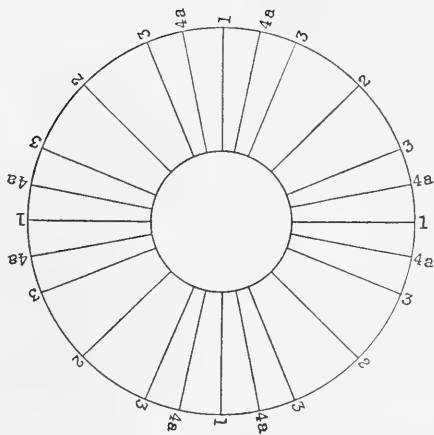
1



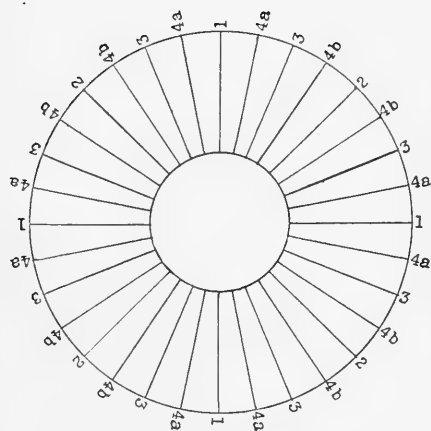
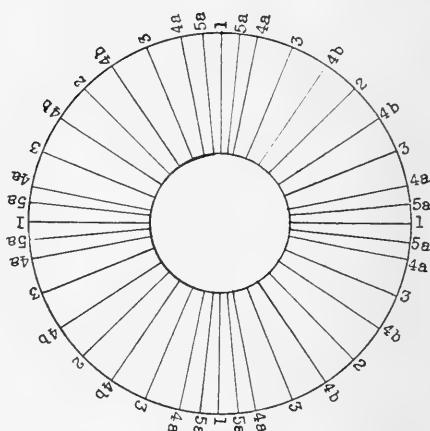
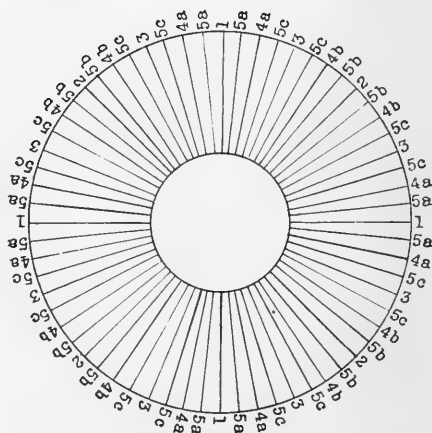
2



3



4

**5****6****7****8**

The Quantitative Study of Climatic Factors in Relation to Plant Life.

By J. ADAMS, M.A. (Cantab.)

Presented by C. GORDON HEWITT, D.Sc., F.R.S.C.

(Read May Meeting, 1916).

If one were to choose at random a square mile of territory in Anticosti Island, Southern Saskatchewan and Vancouver Island and were to compile a list of the native plants in each of the three selected areas, a striking difference in the flora would be observed. Or, if the areas chosen were situated on an alpine slope and on the floor of a valley several thousand feet below, the difference would be equally remarkable. The differences might be due to some extent to the chemical composition and physical characters of the soil or underlying rock but in the main they are to be attributed to the climate.

In a vague sense every person knows what is meant by climate or "weather" but the separate elements or factors composing it are interrelated in a very complex manner and rarely remain constant for any considerable length of time. If we are to make any headway in understanding the relation that exists between climate and plants we must as far as possible dissociate the separate factors and study them one by one. But when we have done this it will be well to remember that the part played by each factor when all the factors act together will not be quite the same as we might have supposed from our consideration of any one factor acting alone. For example, if a certain total amount of heat causes a definite increase in growth when the amount of moisture in the soil is sufficient and the sun shines brightly each day the result with a deficiency of moisture or with a cloudy sky may be quite different even although the amount of heat received by the plant may be the same. Nevertheless, a careful analysis of all the climatic factors acting at any particular locality for a series of years should not only help to elucidate the present distribution and structural characters of the flora but should at the same time yield useful information as to the crop-producing possibilities of the district in question.

Before considering the various climatic factors that influence plants it will be advisable to determine what time-periods may best be employed in endeavouring to express in a concise way the total effect of each factor. Some units of time may be considered as natural, others as arbitrary or artificial.

The year may be considered a natural period of time, representing as it does, the time occupied by the earth in traversing its orbit around the sun. In extratropical regions the year consists of two distinct seasons, namely, a warmer or summer season, and a colder or winter season. Spring and autumn are merely transitional periods between the seasons of maximum and minimum temperatures. If the year is divided equally between these two seasons the six warmer months in the northern hemisphere will extend from May to October and the six colder months from November to April. These periods accordingly are taken as the summer and winter seasons in the present discussion.

The month, representing approximately the time taken to complete the phases of the moon may be regarded as a fairly natural period.

As the average year consists of 365 days and some hours it is obviously not possible to divide it into equal parts. But under the present arrangement the month of February is an anomaly and there appears to be no satisfactory reason why each of the twelve months should not consist of either 30 or 31 days. As, however, the reports of the Meteorological Service are made out in terms of the months as they stand I have adhered throughout to the present system.

The day is also a natural unit representing the time taken for one complete revolution of the earth on its axis. The week is an artificial period of time and would serve a useful purpose if it were of such a length that the weeks could be grouped into months without leaving any odd days. As this is not possible I have in consequence discarded it as a time-unit. In any scheme of dividing the months into shorter time-periods of a number of days each it will be an advantage to have an even number of such periods so that climatic data for half the month may be readily available if desired. The choice, therefore, lies between a three-day and a five-day period and the five-day period has been adopted as the most suitable intermediate time-period between the day and the month. The months will consequently be divided into six periods of five days each. Where the month contains 31 days the last period will contain six days. The last period in February will contain three days, or in a leap year four days. As the length of the year makes it impossible to divide it into 12 months of exactly equal length, so it is impossible to divide a month of 31 days into exactly equal parts.

The hour, although an artificial unit, is a useful measure of time for indicating fractions of a day.

The daily record will of course form the basis for most generalisations on the subject of climate.

CLIMATIC FACTORS.

In the present discussion only the more prominent factors are taken into consideration although probably every slight variation of any one of the numerous constituents of a climate affects to some extent the vegetation of the locality in question. For example, barometric pressure, relative humidity, and cloudiness are not dealt with partly for the reason that it is difficult to give a general and concise summary of each for the year or half year. Barometric pressure considered by itself seems to have little effect on plants except possibly those growing at high altitudes. The indirect consequences, however, in the form of rain and wind are of great importance. The effects of relative humidity and cloudiness are probably better expressed under evaporation and sunshine.

An enumeration of the climatic elements considered by Schimper to be of most importance in relation to plants will be found in his "Plant Geography" English Edition, 1903.

The factors here considered may be grouped under five heads, namely, Temperature, Light, Precipitation, Evaporation, and Wind. In dealing with the climate of any particular place the latitude, longitude and altitude above the sea-level should always be given. The latitude, etc., of the places mentioned in this paper are as follows:—

Locality.	Altitude	Latitude N.		Longitude W.	
	Feet.	Deg.	Min.	Deg.	Min.
Barkerville, B.C.....	4,180	53	2	121	35
Charlottetown, P.E.I.....	38	46	14	63	10
Clayoquot V.I, B.C.....	40	49	11	125	47
Dawson, Y.T.....	1,052	64	4	139	20
Edmonton, Alta.....	2,158	53	33	113	30
Fort Vermilion, Alta.....		58	27	116	3
Fredericton, N.B.....	164	45	57	66	36
Glacier, B.C.....	4,072	51	14	117	29
Haileybury, Ont.....	687	47	29	79	39
Halifax, N.S.....	88	44	39	63	36
Indian Head, Sask.....	1,924	50	28	103	40
Kamloops, B.C.....	1,245	50	41	120	29
Long Point, Ont.....		42	36	80	20
Montreal, Que.....	187	45	30	73	35
Ottawa, Ont.....	286	45	26	75	42
Port Arthur, Ont.....	644	48	27	89	12
Qu'Appelle, Sask.....	2,115	50	30	103	47
Sable Island, N.S.....	25	43	57	60	6
St. John, N.B.....	75	45	17	66	4
St. John's Newf.....	125	47	34	52	42
Toronto, Ont.....	379	43	40	79	24
Triangle Island, B.C.....	680	50	52	129	5
Vancouver, B.C.....	136	49	17	123	5
Victoria V. I., B.C.....	85	48	24	123	19
Winnipeg, Man.....	760	49	53	97	7

In the figures given below the results for only three years have, as a rule, been summarized. In some cases the results for only one or two years are given, as complete records for three years were not available. The figures are quoted chiefly to serve as examples of the method of measuring the variations found in different parts of Canada and are a sufficient approximation for this purpose. A ten-year record would give a fairly correct estimate of the climate of any place; for extreme departures it would probably be necessary to have records for a period of one hundred years.

Most of the figures quoted below are based on the Annual Reports of the Meteorological Service of Canada and refer to that country only. No figures relating to evaporation are given in these reports, consequently I have had to fall back on other sources of information in respect to that factor. In the section dealing with Light no data appear to be available on sun-temperatures.

TEMPERATURE.

Various schemes have been devised for measuring the total effect of temperature. In most of these schemes a certain starting point has been fixed below which it is assumed plant-growth does not take place. Hervé Mangon¹ and Merriam² consider that plant life is dormant below a mean temperature of 6°C. (or 43° F.) Merriam accordingly reckons up the total quantity of heat within the period when the normal mean daily temperature is 43° F. or higher. He adds together the mean daily temperature for this period after deducting 43° F. from each. He also states that "the southward distribution is governed by the mean temperature of a brief period during the hottest part of the year" this period being taken tentatively as six weeks.

MacDougall³ starts with the freezing point and sums up all temperatures above this as "hour-centigrade-degree" units, basing his results on thermographic records.

Livingston⁴ regards the growing season as the average length of "the frostless season, the number of days which intervene between the average date of the last killing frost in spring and the first in autumn." Elsewhere he appears to regard a killing frost as 32° F. or lower. He sums up the result in what he calls temperature efficiencies. "To obtain the daily temperature efficiencies corresponding to the various normal daily temperature means it is necessary merely to deduce them from our basic assumption namely, that the growth rate is unity at 40° F. and that it doubles for each rise of 18° F. above this." By this method of reckoning a mean daily temperature of 76° F. has twice the effect of a mean daily temperature of 58° F.

Unstead⁵ takes the temperature of 5° C. (41° F.) as the lower limit of growth and calculates accumulated temperatures in terms of "day-degrees." He deducts 5° C. from the mean daily temperature and multiplies this by the number of days during which the plant is growing; this gives the number of day-degrees.

McLean⁶ states that "the growth rate tended to vary almost directly with the "temperature index" when the air temperatures were

¹ Plant Life of Maryland. 1899.

² Merriam, C. H.—Life Zones and Crop Zones of the United States. U.S. Dept. Agric. Div. Biol. Surv. Bull., 10. 1898.

³ MacDougall, D. T.—The Temperature of the Soil. Journal N.Y. Bot. Garden 3: 125-131, 1902.

⁴ Livingston, B.E. and G. J.—Temperature Coefficients in Plant Geography and Climatology. Bot. Gaz. 56: 349-375, 1913.

⁵ Unstead, J. F.—The Climatic Limits of Wheat Cultivation with special reference to North America. The Geographical Journal, Vol. 39, 1912.

⁶ McLean, F. T.—Relation of climate to Plant Growth in Maryland. Mon. Weather Review, 43: 65-72, 1915.

low. With high air temperatures the growth rate was relatively much greater than can be accounted for by the "temperature indexes" alone. The "temperature index" is taken as the mean daily temperature above 40° F.

The above mentioned schemes relate to degrees of heat but very few attempts appear to have been made to measure cold. Angot⁷ proposed a method of classifying winters by the sum of the minimum monthly temperatures below 0° C.

Of all the starting points that have been suggested the freezing point of water appears to be the most appropriate. The actual temperature at which a plant begins to carry on its functions varies with the species and with the climate to which the plant has been accustomed. Vinson⁸ states that the rate of growth of the date palm throughout the entire year is in most cases in proportion to the heat time units over 50° F. and Swingle⁹ says that a daily mean temperature of 64.4° F. is the zero point of activity of the date tree as far as flowering and fruiting functions are concerned.

On the other hand in the case of many species of plants to assume that the temperature of 6° C. (41° F.) inhibits their growth is not in accordance with the facts. Johnson¹⁰ states that the minimum temperature for the germination of the uredospores of *Puccinia graminis* is 2° C. A species of fungus grows vigorously on the surface of grass and decaying vegetation under melting snow and bacteria increase in numbers in frozen soil. Kjellman¹¹ mentions many species of Algæ which bore re-productive organs at temperatures of—1.8° to 0° C.

Livingston's proposal to regard the growing season as coterminous with the frostless period cannot be applied rigidly. For example, at Ottawa, tulips were one inch high above the ground when the temperature fell to 10° F. on March 30, 1915, after which they continued their growth without injury. In fact, if we adhered strictly to the frostless period as the boundary of the growing season of plants we should be led to the conclusion that no plant life is possible in regions which we know to be covered with vegetation. Day¹² argues as follows:—In the elevated mountain regions and on some

⁷ Bull. Soc. Nat. Agric. France, 73: 186-8, 1913.

⁸ Vinson, A. E.—The effect of climatic conditions on the rate of growth of date palms. Bot. Gaz. 57: 324-7, 1914.

⁹ Swingle, W. T.—The date palm and its utilization in the Southwestern States, U.S., Dept. Agr. Bur. Pl. Indus. Bull., 53, 1904.

¹⁰ Phytopathology, 1912.

¹¹ Kjellman, F. R.—The Algæ of the Arctic Sea. 1883.

¹² Day, P. C.—Frost data of the United States and length of the crop-growing season. U.S. Dept. Agric. Weather Bur. Bull. V. 1911.

of the higher plateaus of the western country freezing temperatures are liable to occur in all months of the summer but their effect on vegetation is not so pronounced as in the districts east of the mountains. Owing to the dryness of the air, frost does not always form with a temperature of 32° F. or even several degrees lower and in addition plant life subjected to such variations in temperature becomes more hardy and lower temperatures are required to cause serious injury. As an example of the above, Barkerville in British Columbia may be cited where frost may occur in every month of the year.

In the present paper a heat-unit is taken to mean a temperature of 1° F. above 32° F. continued for one hour. Similarly temperatures below 32° F. are reckoned as cold-units. As a basis of these calculations the daily maximum and minimum temperatures are taken. If both are above 32° F. the mean is taken, 32° F. are deducted and the remainder multiplied by 24 gives the number of heat-units. Similarly when both maximum and minimum are below 32° F. the number of cold-units is calculated. When the maximum is above 32° and the minimum below 32° the number of heat and cold-units must be ascertained separately. In this case it is assumed that the temperature remain above 32° F. for 12 hours and below 32° for the other 12. Thus the maximum and minimum temperatures at Ottawa on April 3rd, 1916, were 39 and 20 and the number of heat and cold-units registered would be 3½ and 6 respectively. This appears to be a preferable method to taking the mean temperature 29½ deducting it from 32 and expressing the result as 2½ cold-units. It has to be remembered that the maximum temperatures are those in the shade while the temperature in the sun may be sufficiently high for a certain amount of photosynthesis to take place. Thus at Ottawa on March 14th, 1915, the shade temperature was 34½° at the same time that the temperature in the sun was 82°F. Calculations based on the maximum and minimum temperatures of each 24 hours to determine the number of heat and cold-units are only approximately correct. Much more accurate results are obtained from thermographic records for each hour of the day. The amount of error in the result arrived at by the former method is considerable. Thus at Toronto the figures for January and July 1912, are as follows:—

	Heat units. Jan.	Cold units. Jan.	Heat Units. July.
Thermographic record as basis.....	54·6	16,190·4	27,304·8
Maximum and Minimum as basis.....	144·0	13,610·4	27,974·4

The average number of heat-units and of cold-units for each half year at a number of places in Canada will be found in Table I.

TABLE I.

UNITS OF HEAT AND COLD, 1909-12.

	Heat units Nov.-Apr.	Cold units Nov.-Apr.	Heat units May-Oct.	Cold units May-Oct.
Dawson.....	4,516	155,041	75,968	7,958
Victoria.....	46,227	1,698	108,666	0
Barkerville.....	8,229	53,146	61,255	3,332
Edmonton.....	19,072	68,038	97,594	2,120
Qu'Appelle.....	12,462	87,949	93,392	2,572
Winnipeg.....	13,053	85,283	113,651	1,613
Port Arthur.....	11,100	60,910	98,005	1,252
Toronto.....	22,726	28,747	130,791	104
Montreal.....	16,050	46,650	127,032	85
St. John.....	17,951	30,995	103,686	43
Halifax.....	20,341	25,444	112,943	201
St. John's.....	15,293	25,136	91,842	340

Hourly thermographic records are at present published only for Victoria and Toronto, and bi-hourly records for Montreal and Quebec.

While the maximum temperature for the year has no special significance in relation to plant life the minimum temperature is a limiting factor in determining the distribution of many species of plants. Some species succumb if the thermometer falls to 32° F. while others can survive many degrees below zero. The maximum and minimum temperatures recorded for the three years 1909-12 are given in Table II.

TABLE II.

MAXIMUM AND MINIMUM TEMPERATURES (F) 1909-12.

	Maximum.	Minimum.
Dawson.....	82 to 86.5	-54 to -62
Victoria.....	86.7 to 89.8	14.2 to 19
Barkerville.....	75 to 82	-25 to -40
Edmonton.....	87 to 94	-39 to -52
Qu'Appelle.....	88.5 to 95	-38 to -47
Winnipeg.....	89.2 to 99.2	-36.2 to -42
Port Arthur.....	86 to 97	-27 to -36
Toronto.....	92.7 to 103.2	- 6.8 to -11.7
Montreal.....	86.5 to 94.5	-16 to -19
St. John.....	77.5 to 81.5	- 7.7 to -14
Halifax.....	86.3 to 98.7	- 1.4 to -11.6
St. John's.....	82 to 86	- 2 to -10

Active growth is considered to begin when the mean temperature reaches 41° F. or more, subject to certain qualifications. The commencement of spring in the popular sense may be considered to be coincident with the beginning of the period of active growth. Phenologists are wont to fix this date by observations made on the stage of growth reached by certain plants or by phenomena relating to the animal kingdom. But it can be determined equally accurately from observations on temperature based on the five-day period mentioned above. It sometimes happens that the mean temperature of a five-day period is above 41° F. during which period some growth is made; then a five-day period follows with a mean temperature below 41° F. with a corresponding check to growth. The period of active growth is taken as beginning on the first day of the five-day period with a mean temperature of 41° F. or more which is followed continuously by other five-day periods each having a mean temperature of 41° or over. This date appears to agree well with actual observations of the stage of growth reached by plants at the time in question. Thus at Ottawa in 1915 the date of beginning of active growth as measured by temperatures was 6th April and on the 7th of April, hellebore and snowflake were in flower; iris, arabis, doricum, oriental poppy and clover were growing steadily and bees were gathering honey. In 1916 at Ottawa the date as deduced from temperatures was 11th of April. On the 10th of April the first flowers of hellebore were seen, tulips and snowflake were making considerable growth and bees were flying. Snowflake was in full flower on the 15th and iris was growing steadily.

It seems to be desirable to use some such term as "active growth" or "continuous growth" in the sense defined above in contradistinction

to "growth" simply which may take place at a lower temperature. For example, as an indication of the first signs of renewed activity in plants, maple sap was dripping from a broken branch at Ottawa on March 23rd, 1915, although the maximum and minimum temperatures for that day were 48° F. and 25° F. respectively.

A similar definition will hold for the end of the period of active growth. The dates for a number of places throughout the Dominion as well as the length of the active growth period are given in Table III.

TABLE III.
PERIOD OF ACTIVE GROWTH, 1910-12.

	Active growth begins.	Active growth ends.	Average number of days.
Dawson.....	26 Apr. to 1 May	15 Sept.	140
Victoria.....	26 Feb. to 20 Mar.	5 Nov. to 31 Dec.	268
Barkerville.....	1 May to 26 May	20 Aug. to 20 Sept.	119
Edmonton.....	6 Apr. to 1 May	20 Sept. to 25 Oct.	176
Qu'Appelle.....	16 Apr. to 6 June	20 Sept. to 25 Oct.	148
Winnipeg.....	16 Apr. to 1 May	25 Sept. to 25 Oct.	173
Port Arthur.....	6 May	20 October	168
Toronto.....	21 Mar. to 11 Apr.	31 Oct. to 15 Nov.	216
Montreal... ..	16 Apr. to 21 Apr.	25 Oct. to 31 Oct.	193
St. John.....	16 Apr. to 1 May.	31 Oct. to 5 Nov.	192
Halifax.....	16 Apr. to 1 May	31 Oct. to 10 Nov.	197
St. John's.....	21 Apr. to 6 May	14 Oct. to 15 Nov.	182

Instead of estimating the total number of heat-units for the period May to October it might be even more satisfactory to estimate the number of heat-units above 41° F. during the period of active growth, but this has not been attempted at present.

As light frosts may occur during the period of active growth a separate table will be necessary to show the dates of the last frosts in spring and the first frosts in autumn with the number of days between. A frost is taken to mean a temperature of 32° F. or lower: the term "killing frost" is ambiguous, as a frost that would be sufficient to kill tomato plants would have no effect on a turnip crop. The frostless period for the places mentioned is shown on Table IV.

TABLE IV.

FROSTLESS PERIOD, 1910-12.

	Last frost in spring.	First frost in autumn.	Average length in days.
Dawson.....	2 June to 28 June	18 Aug. to 23 Aug.	67
Victoria.....	5 Apr. to 17 Apr.	8 Nov. to 31 Dec.	233
Barkerville.....	9 June to 12 July	8 Aug. to 29 Aug.	53
Edmonton.....	12 May to 13 June	6 Sept. to 14 Sept.	104
Qu'Appelle.....	21 May to 3 June	26 Aug. to 15 Sept.	100
Winnipeg.....	12 May to 2 June	28 Aug. to 26 Sept.	118
Port Arthur.....	13 May to 3 June	12 Sept. to 27 Sept.	118
Toronto.....	4 May to 15 May	16 Oct. to 29 Oct.	165
Montreal.....	28 Apr. to 4 May	16 Oct. to 29 Oct.	176
St. John.....	29 Apr. to 6 May	3 Oct. to 17 Oct.	161
Halifax.....	17 May to 23 May	15 Sept. to 4 Oct.	130
St. John's.....	24 May to 7 June	4 Oct. to 12 Oct.	126

In making observations on frosts considerable differences will be found at different heights above the ground. Thus Koslovskii¹³ who experimented with seven thermometers placed at different heights above the ground found that the minimum temperature was recorded between 2 and 3 feet above the surface of the soil.

Instead of estimating the mean temperature of the hottest six weeks as suggested by Merriam the number of days of tropical heat are given. A day with tropical heat is defined as a day with a mean temperature of 68° F. or over and the figures are given in Table V.

TABLE V.

DAYS WITH TROPICAL HEAT, 1910-12.

Dawson.....	1
Victoria.....	4
Barkerville.....	1 in three years.
Edmonton.....	7
Qu'Appelle.....	14
Winnipeg.....	28
Port Arthur.....	9
Toronto.....	45
Montreal.....	37
St. John.....	6
Halifax.....	22
St. John's.....	7

¹³ Bull. Bur. Agric. Int. 3: 1926. 1912.

It will be evident from the above figures that the southern part of Ontario has a larger number of very warm days than any other province. It is noteworthy that such species as blue ash, papaw, tulip tree, cucumber tree, black gum, sassafras, sycamore, chestnut and numerous other species occur here and nowhere else in Canada. So far as the element of temperature is concerned this region has obviously crop-producing possibilities which are not equalled by any other part of the Dominion.

LIGHT.

Light is essential for the growth of most of the higher plants. Bright sunshine not only raises the temperature of the air, but also promotes evaporation of moisture from the soil. Other factors remaining the same bright sunshine as compared with diffuse light accelerates photosynthesis and transpiration. It also influences pollination since on a sunny day more insects will be on the wing. The duration of bright sunshine can be readily measured in hours: in addition the number of hours of diffuse light should also be recorded. In summer the higher slopes of mountains and places in higher latitudes have a longer period of daylight, and this greater duration of daylight even with a lower temperature may produce as great an effect on plants as a shorter period of light with a higher temperature in places lying nearer the equator. Sunshine records for a number of places are given in Table VI and the duration of sunshine, diffuse light, and darkness at Edmonton and Toronto are given in Table VII.

TABLE VI.

BRIGHT SUNSHINE.

AVERAGE NUMBER OF HOURS, 1909-12.

	Nov.-Apr.	May-Oct.
Victoria.....	578	1,265
Vancouver.....	564	1,195
Kamloops.....	659	1,391
Edmonton.....	772	1,311
Indian Head.....	694	1,202
Winnipeg.....	781	1,289
Haileybury.....	727	1,222
Toronto.....	693	1,321
Montreal.....	618	1,235
Fredericton.....	806	1,190
Charlottetown.....	653	1,206

TABLE VII.

SUNSHINE, DIFFUSE LIGHT AND DARKNESS.

MAY-OCT, 1912.

	Sunshine hours.	Diffuse light hours.	Darkness hours.
Edmonton Lat. 53° 33'.....	1,299	1,377	1,740
Toronto Lat. 43° 40'.....	1,223	1,296	1,897

The present method of reckoning sunshine in hours expresses only a part of the result. For example, the temperature in the sun at Ottawa on April 15th, 1916, was 87° F. at 2 p.m., 76° F. at 3 p.m., 77° F. at 4 p.m., and 68° F. at 5 p.m. and on the 16th April, 1916, the temperatures were 47° F. at 6 a.m., 52° F. at 7 a.m., 61° F. at 8 a.m., and 73° F. at 9 a.m. In expressing the result as sunshine hours the three hours from 2 to 5 p.m., have the same value as the three hours from 6 to 9 a.m. A better method would be to multiply the number of hours of sunshine by the average temperature in the sun during the period in question after deducting 32° and call the figures "sunshine-degrees." The number of sunshine degrees in the case quoted for the three hours 2 to 5 p.m., would be $134\frac{1}{2}$ and the number for the other three hours 6 to 9 a.m., would be 77 sunshine degrees.

PRECIPITATION.

Equally with temperature the amount of rain is of fundamental importance in relation to plant life. Not only is the total amount of rain that falls of great importance but its distribution in time. A torrential rainfall such as occurs in connection with a thunderstorm when an inch of rain may fall in one hour has not the same permanent effect as the same amount of rain falling continuously for six hours. In the former case, especially on a sloping surface or clayey soil a large proportion of the water runs off into the nearest stream instead of being absorbed by the soil as it falls.

On the other hand a slight rainfall of one-hundredth or even one-tenth of an inch occurring during the warmer months only wets the surface soil and does not add to the moisture of the deeper layers. It is consequently soon lost by evaporation. Shreve ¹⁴ states that at

¹⁴ Shreve F. Rainfall as a determinant of soil moisture. Plant World, 17 Jan 1914

Tucson, Arizona, a rainfall of less than .15 of an inch does not affect the soil moisture. As an example of the amount of rain required to saturate the soil after a considerable period of drought it may be stated that at Ottawa rain fell for fourteen hours on the 4th of August, 1915. Altogether one inch of rain fell, but it only penetrated into the soil to a depth of seven inches. Below this depth the soil was quite dry and hard. Some rainfall figures are given in Table VIII.

TABLE VIII.

RAINFALL AND SNOWFALL, 1909-12

	Rain Nov.-Apr. Inches.	Rain May.-Oct. Inches.	Snow Nov.-Apr. Inches.	Snow May.-Oct Inches.
Clayoquot.....	70.83	31.24	7.6	0
Vancouver.....	35.95	17.68	32.4	0
Glacier.....	.81	18.60	435.2	20.7
Fort Vermilion 1910-12...	.43	6.54	32.2	2.7
Qu'Appelle.....	.89	12.72	49.6	12.8
Toronto.....	8.91	16.88	64.9	.5
Halifax.....	24.56	24.14	79.6	.2

Not only should the total rainfall for the two halves of the year be given for any particular locality but its duration in time should also be known. As rain washes the pollen of many flowers on to the ground or in many cases affects its vitality injuriously, the duration of the rainfall is important from this point of view. In fact very little pollination either by wind or insects can take place while rain is falling. The usual method of expressing the number of days on which one hundredth of an inch or more of rain falls is not satisfactory as this amount is so small as to have very little effect. Probably a better way would be to measure the duration of the rainfall in hours instead of days. While the moisture requirements of different species of plants vary greatly it may be safely assumed that the amount of rainfall should be at least equal to the evaporation from the surface of water. Using the five-day period a fair estimate of the distribution of the rainfall during the season of growth may be made by adding up the number of five-day periods with a rainfall of half an inch or more. These figures are given in Table IX.

TABLE IX.
NUMBER OF FIVE-DAY PERIODS WITH $\frac{1}{2}$ INCH OR MORE OF RAIN.
MAY-OCTOBER, 1910-12.

Victoria.....	5
Qu'Appelle.....	12
Toronto.....	12
Halifax.....	13

In the absence of data showing the actual number of hours in which a given amount of rain falls the number of thunderstorms during the growth period will furnish valuable information as to the torrential character or otherwise of the rainfall. These are given in Table X.

TABLE X.
AVERAGE NUMBER OF THUNDERSTORMS MAY-OCT., 1910-12.

Clayoquot.....	1 in 3 years.
Vancouver.....	3
Glacier.....	1
Fort Vermilion.....	8
Qu'Appelle.....	15
Toronto.....	24
Halifax.....	4

Fogs are somewhat similar in their effects to rain but contribute little to the moisture content of the soil. As they prevent pollination, diminish photosynthesis and transpiration and lower the temperature, the number of fogs in any locality is of considerable importance. Those for a number of different places are given in Table XI.

TABLE XI.
FOGS 1909-12.

	Average for 6 months. Nov.-Apr.	Average for 6 months. May-Oct.
Triangle Island, 1910-12.....	91	99
Vancouver.....	12	5
Qu'Appelle.....	4	5
Port Arthur.....	3	18
Toronto.....	12	11
Ottawa.....	1 in 3 years..	1 in 3 years.
St. John.....	12	33
Charlottetown.....	2	2
Halifax.....	8	13
Sable Island.....	26	67

Snowfall affects vegetation in at least two ways. In regions with extreme temperatures a thick covering of snow prevents frost from penetrating into the soil as far as it might otherwise do. In forests situated on mountain slopes the snow takes a considerable time to melt and thus furnishes a more permanent supply of moisture than if it fell in the form of rain with a much quicker rate of run-off. Some snowfall totals are given in Table VIII.

Hail, if measured by the damage it sometimes causes in field crops is of importance; but as it produces no permanent effect or special botanical features in the native vegetation of a district it is not considered at further length here.

EVAPORATION.

Rainfall figures alone are of comparatively little value unless we know at the same time the amount of evaporation taking place. As the evaporation from the surface of the soil will depend to a great extent on the nature of the soil, its texture, colour, etc. and would at the same time be difficult to measure, it is much more satisfactory to determine the evaporation from a freely exposed water surface. The rate of evaporation will vary concurrently with a number of other factors such as temperature, sunshine, wind, and relative humidity of the atmosphere. It may be safely assumed that a high rate of evaporation from a water surface will indicate a high rate of transpiration from most plants unless they have some special adaptation to resist drought. It is consequently a factor of great importance in plant life. Livingston and Shreve¹⁵ emphasize "the importance of evaporation as a compound climatic factor which approaches more nearly to furnishing a criterion of vegetational possibilities than any other which is readily measured." Prolonged evaporation will result in reducing the plant's activities to a dormant state, or may even result in its death.

Broounoff¹⁶ in connection with the study of evaporation in Russia uses the term "dry ten-day periods" by which he understands periods of ten days during which the total rainfall does not exceed 5 mm.

In the National Weather and Crop Bulletin of the United States¹⁷ a drought is defined as a period of thirty consecutive days or more in which the precipitation does not amount to .25 in. in any 24 hours.

¹⁵ Livingston, B. E. and Shreve, F. The Relation between climatic conditions and plant distribution in the United States. Johns Hopkins University, Circ. N.s. 2: 19-20, 1912.

¹⁶ Mon. Bul. Agr. Int. and Plant Dis. V: 325-9. Mar. 1914.

¹⁷ No. 7 p. 6, 1915.

In measuring evaporation the total amount for the summer period should be determined as well as its relation to rainfall throughout the season. This relation may be fairly gauged by reckoning up the number of five-day periods with evaporation in excess of rainfall. When several successive five-day periods are characterized by an evaporation exceeding the rainfall a drought may result. Such a drought, if prolonged, may seriously affect the growth of plants; accordingly the duration of the longest drought during the summer season is of importance. This is taken to mean the greatest number of successive five-day periods with evaporation in excess of rainfall.

As very few figures relating to evaporation in Canada are available the following are some observations made by myself at Ottawa during the summer of 1915. They are grouped for the most part but not entirely according to the five-day period. (Table XII).

TABLE XII.

EVAPORATION AND RAINFALL AT OTTAWA, 1915.

	Evaporation (Inches).	Rainfall (Inches).
May 1-5.....	?	.50
" 6-10.....	.45	.75
" 11-15.....	.60	.30
" 16-20.....	.30	.40
" 21-25.....	.45	.20
" 26-31.....	1.00	.15
June 1-5.....	.90	.00
" 6-10.....	1.00	.10
" 11-15.....	.75	2.55
" 16-20.....	.80	.55
" 21-25.....	.75	.15
" 26-30.....	.85	.00
July 1-5.....	.70	.45
" 6-10.....	.65	.15
" 11-15.....	.90	.00
" 16-20.....	.50	.95
" 21-26.....	.85	.30
" 27-31.....	.40	.00
Aug. 1-5.....	.75	1.05
" 6-10.....	.45	1.75
" 11-16.....	.70	.90
" 17-21.....	.55	.15
" 22-27.....	.50	2.55
" 28-31.....	.15	.85

The greatest drought was from June 16th to July 15th. Briggs & Shantz¹⁸ have adopted the five-day period in their researches on evaporation at Akron, Colo., for the months of April to September inclusive, during the two years 1912 and 1913. During 1912 there were 30 five-day periods with evaporation in excess of rainfall out of a total of 36 and in 1913 there were 33 with evaporation in excess of rainfall. The longest drought in 1913 covered 31 five-day periods.

The average evaporation¹⁹ at Lincoln, Nebraska, from May to October for the 16 years 1895–1910 inclusive was 34.56 in., while the rainfall for the same months was 23.24 inches.

At Tucson, Arizona, the average rainfall for 15 years was 11.74 inches while the normal annual evaporation amounted to 90 inches.

WIND.

Wind affects plants in several ways. On mountain tops and on sea coasts the constant blowing of the wind has a dwarfing effect on many plants, producing the "cushion" type of vegetation while a region that is subject to violent gales is unsuited for the growth of broad-leaved trees. Attempts to establish trees in Sable Island proved unsuccessful. A region subject to winds may be expected to contain a large percentage of anemophilous plants in its flora and at high altitudes vivipary may result. Wind also plays a prominent part in the dissemination of many types of fruits. Further, wind greatly increases the evaporation of water from the surface of the soil and stimulates the rate of transpiration in plants. Some estimate of wind-effects in different regions may be gained from a survey of the total number of miles travelled by the wind during each half year period and from observations of the maximum velocity. A high wind occurring when trees are in full leaf will be much more disastrous in its effects than it would be if the leaves have fallen. Some figures relating to winds are given in Table XIII.

¹⁸ Briggs, L. J. and Shantz, H. L.—Relative Water requirements of plants. *Journ. Agr. Research* III. 1–64. Pl. VII, 1914.

¹⁹ Loveland, G. A. and Perin, S. W. Evaporation from a free water surface at Lincoln, Nebraska, 25th An. Rep. Agr. Exp. Sta. Neb. 1912.

TABLE XIII.

WINDS, 1909-12.

	Total miles Nov.-Apr. Average.	Maximum velocity in miles per hour. Nov.-Apr.	Total miles May-Oct. Average.	Maximum velocity in miles per hour May-Oct.
Triangle Island, 1910-12...	115,636	100	59,596	100
Victoria.....	38,949	42	37,483	40
Kamloops.....	23,118	25	22,151	20
Qu'Appelle.....	37,554	34	34,365	28
Winnipeg.....	51,310	56	50,822	46
Long Point, 1914-15.....	71,878	60	53,928	96
Toronto.....	56,393	56	40,084	42
Halifax.....	55,144	50	42,966	43
Sable Island.....	94,361	64	72,901	51

When observations somewhat along the lines indicated in the foregoing pages, and possibly in other directions also, have been made at a large number of representative stations chosen at different altitudes it should then be possible to divide the earth's surface into a series of biological provinces which would show in a much more exact manner than has hitherto been attempted, the distribution of the fauna and flora in relation to their environment. Further, such data when applied to the various species of plants already grown in the service of man, should render the cultivation of these even more successful in the future than has been the case up to the present when the possibilities of the effect of climatic factors on the yield of plants is only beginning to be fully realized.

Geological Structure of the Basin of Lake St. John, Quebec.

By JOHN A. DRESSER, M.A., F.R.S.C.

(Read May Meeting, 1916).

GENERAL.

Lake St. John is situated 120 miles north of the city of Quebec, and about the same distance from the mouth of the Saguenay river, its outlet, which enters the St. Lawrence at the historic little town of Tadousac. It is a beautiful sheet of water, rudely circular, rather more than 20 miles in breadth, and has an area of 350 square miles. It lies in a basin of roughly triangular shape whose area is not yet entirely defined but is approximately seven or eight times as great as that of the lake. The average altitude of the basin may be taken as 500 feet, that of the surrounding country, as 1,000 feet above sea level. The boundary of the basin in most places is a well defined escarpement varying in height from 100 to 600 feet, followed outward from the basin by a more gradual rise in the surface until the general level of the highland is reached.

GENERAL GEOLOGY OF THE REGION.¹

The region is a part of the great Pre-Cambrian protaxis of eastern North America and considered physiographically it is within the Laurentian plateau or peneplain. The underlying rocks are principally granites, gneisses and anorthosites, of Pre-Cambrian age. Within the basin, however, there are outliers of Ordovician sediments. These consist chiefly of limestones and shales belonging respectively to the Trenton and Utica formations, with a small exposure of Richmond age. They are, evidently remnants of sedimentary deposits of greater thickness and extent, which at one time probably occupied the entire basin, and perhaps a much greater area. Their preservation from complete erosion and removal is apparently due to their protected position in the basin.

¹ References to previous geological work in the district:—

Jas. Richardson, Geological Survey of Canada, Annual Report, 1857.

Rev. J. C. K. Laflamme, Geological Survey of Canada, Annual Report, 1883-4.

Dr. F. D. Adams, Geological Survey of Canada, Summary Report, 1883-4.

Dr. G. A. Young, Geological Survey of Canada, Summary Report, 1900.

(Published by permission of the Director of the Geological Survey of Canada).

LOCAL GEOLOGY OF THE BASIN.

The following formations occur within the basin or in the face of the escarpment which bounds it:—

	Sedimentary	Igneous
Ordovician.....	Richmond.....Limestone	
	Utica.....Shale	
	Trenton.....Limestone	
Pre-Cambrian...	Roberval.....Granite and gneiss	
	Saguenay.....Anorthosite	
	Laurentian.....Gneiss	
	Grenville.....Crystalline limestone	

Laurentian. The Grenville comprises only two small patches of a few hundred square feet on the front of the escarpment. The other formations occur in larger areas, and all are frequently covered by superficial deposits of quarternary age, which are not specified in the above list. Laurentian gneiss is therefore, the oldest formation that is present in large development. Both dioritic and granitic phases appear, and wherever seen it is intensely metamorphosed. It presents the usual characteristics of this great system and calls for no special description for the purposes of this paper.

Saguenay. The anorthosite is part of the great development of this peculiar rock, which has been fully described by Dr. F. D. Adams¹ under the name of the Saguenay area. It consists essentially of basic plagioclase, with subordinate augite, hypersthene, olivine and hornblende. Prior to Dr. Adams' investigation, the anorthosite, in accordance with the theory of the sedimentary origin of many crystalline rocks then in vogue, was regarded as an upper member of the Laurentian, overlying the gneisses in stratigraphic sequence. Dr. Adams' researches, however, showed conclusively that the anorthosite, here, as in other localities, is an igneous rock, and is here intrusive in the Laurentian gneisses, and consequently is of later age. As it does not occupy a distinct position in the stratigraphic succession, the previously assumed upper Laurentian was thus proven not to exist. The total area occupied by this formation in the Saguenay district is known to be more than 5,000 square miles. The part of it this is contained in the basin of Lake St. John is little, if any, more than 200 square miles. Certain portions of this are notable for the large deposits of titaniferous magnetite found in them, which, it is confidently hoped, the advance of metallurgical science will soon render useful.

¹ Ueber das Norian oder Ober-Laurentian," Neues Jahrbuch für Mineralogie, etc., Bd. VIII, Stuttgart, 1893.

Roberval. The name Roberval is proposed for the granite and gneiss which constitute the next younger formation in this district. While there is objection to the introduction of local term in a list of formations as is given above especially in such a way as to make it equivalent in importance to Laurentian, it is a manifest convenience in description to have a name. Also in the district under discussion the formation designated as Roberval, occupies a larger area than any other. It comprises granite, granite-gneiss and pegmatite, which consist essentially of microcline with subordinate amounts of oligoclase and labradorite, quartz, biotite and hornblende. Pyrite, magnetite, sphene and apatite are common accessories. Portions of the formation are massive, but the greater part is gneissic in structure. The large crystals of microcline in many places give rise to an augen-gneiss. Petrographically this formation is not essentially different from acid phases of the Laurentian, but it is distinguished from that formation by its structural relations.

The Roberval is plainly intrusive in all three of the earlier formations. Evidences of such relations may be found in lot 1, range 1 of the township of Metabetchouan and in that immediate vicinity. Here crystalline limestones and anorthosites are cut by numerous dykes and arms of Roberval granite, and in lot 2 of the same range Laurentian is intruded by anorthosite. Roberval and Laurentian were not found in contact at this point, but in the III range of the township of Ouiatchouan lot 9, near the road leading from Roberval to St. Hedwidge, and in other places in the same range, stocks of Roberval granite pierce Laurentian gneiss, where they send off dykes and apophyses and deflect the strike of the gneiss in a manner characteristic of intrusive contacts.

The Roberval has not been hitherto separated from the Laurentian, but intrusions of granite in anorthosite have been noted by Dr. Adams and Dr. G. A. Young.¹ Also Dr. A. E. Barlow² distinguished a similar rock formation in the Chibougamau region which he designated as massive granite, noting that it was younger than the anorthosite of that district.

The later limit of its age cannot be actually determined more precisely than as pre-Trenton. The Roberval, however, was foliated and eroded before the deposition of the Trenton, and is therefore assumed to be of Pre-Cambrian age. A granite apparently quite similar in character and in age relations has been described from the

¹ Summary Report, Geological Survey, 1900.

² Barlow, Dr. A. E., "Report on the Chibougamau Mining Region," Dept. of Mines, Quebec, 1910.

Thousand Islands district under the name of the Picton granite, by Professor H. P. Cushing.¹

Erosion Interval. A long interval of erosion must have taken place between the intrusion of the Roberval and the beginning of Ordovician sedimentation. The earliest sediments of this time. Trenton limestones, were deposited on coarse plutonic rocks, which have a surface relief comparable to that of the Pre-Cambrian of the present day. Yet they show little, if any, surface decomposition, or erosional detritus. A few well rounded pebbles of granite or quartz are occasionally found in the lower beds of limestone. But they are rare, and nowhere form a definite basal conglomerate.

Pre-Ordovician erosion appears to have been followed, or accompanied, by very complete removal of erosional débris.

Ordovician. On this surface Trenton, Utica and Richmond sediments were deposited in conformable succession. No later Paleozoic strata have yet been found. In some period after Ordovician time, perhaps early Carboniferous, extensive faulting took place by which a large area was lowered several hundred feet below the general level of the region and the basin of lake St. John was eventually formed.

STRUCTURE OF THE BASIN.

In places where Pre-Cambrian rocks underlie both the highland and the adjacent basin, the escarpment suggests that it is due to faulting. This view is fully confirmed by the structure in places where the Ordovician strata of the basin are seen in contact with the Pre-Cambrian rocks of the surrounding highland. In such places the Ordovician, Trenton limestone, is tilted to a high angle, or broken and crushed into a confused mass. This deformation of the Ordovician at its margin is the more conspicuous as the rocks of this system show very little disturbance elsewhere in the district. (See Plate II, B.) The angle of dip in these sedimentaries is usually less than 6° , but wherever they can be seen around the margin of the basin there is a zone of 100 to 150 yards in width in which the dip is increased to 25° or 50° , generally accompanied by fracturing and displacement of blocks in some part of the zone. Good examples of the fault contact may be seen immediately south of the railway station of Chambord Junction; or along the lake shore in range 1 of the township of Metabetchouan, between lots 30 and 40; or near Ouiatchouan falls in range 2, lot 22 of the township of Charlevoix. In all cases the faults appear to be normal, or gravity faults.

¹Geology of the Thousand Islands Region, N.Y., State Museum Bulletin No. 145.



Quiatchouan Falls, township of Charlevoix. The Quiatchouan river here falls a distance of 245 feet over a portion of the escarpment separating the highland from the lowland.



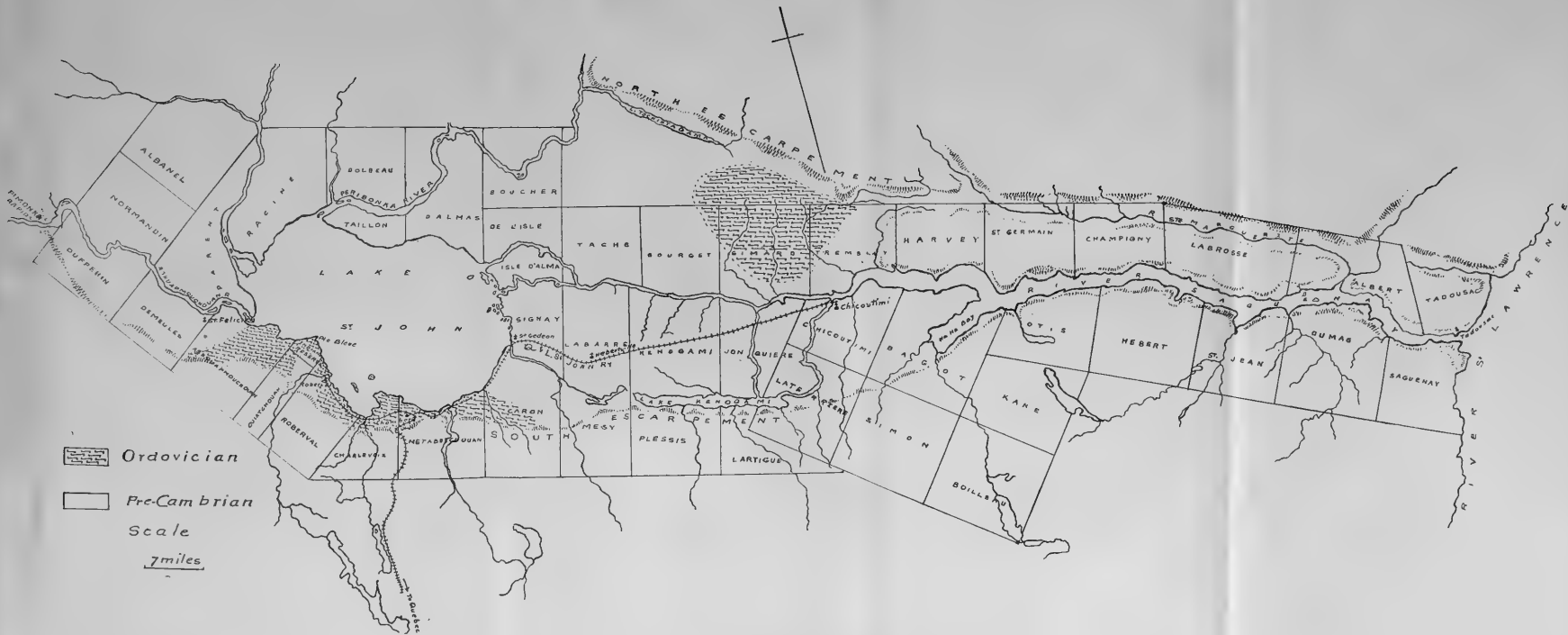
A.

View eastward overlooking the town of Roberval and part of lake St. John.
Note the even surface of the basin.

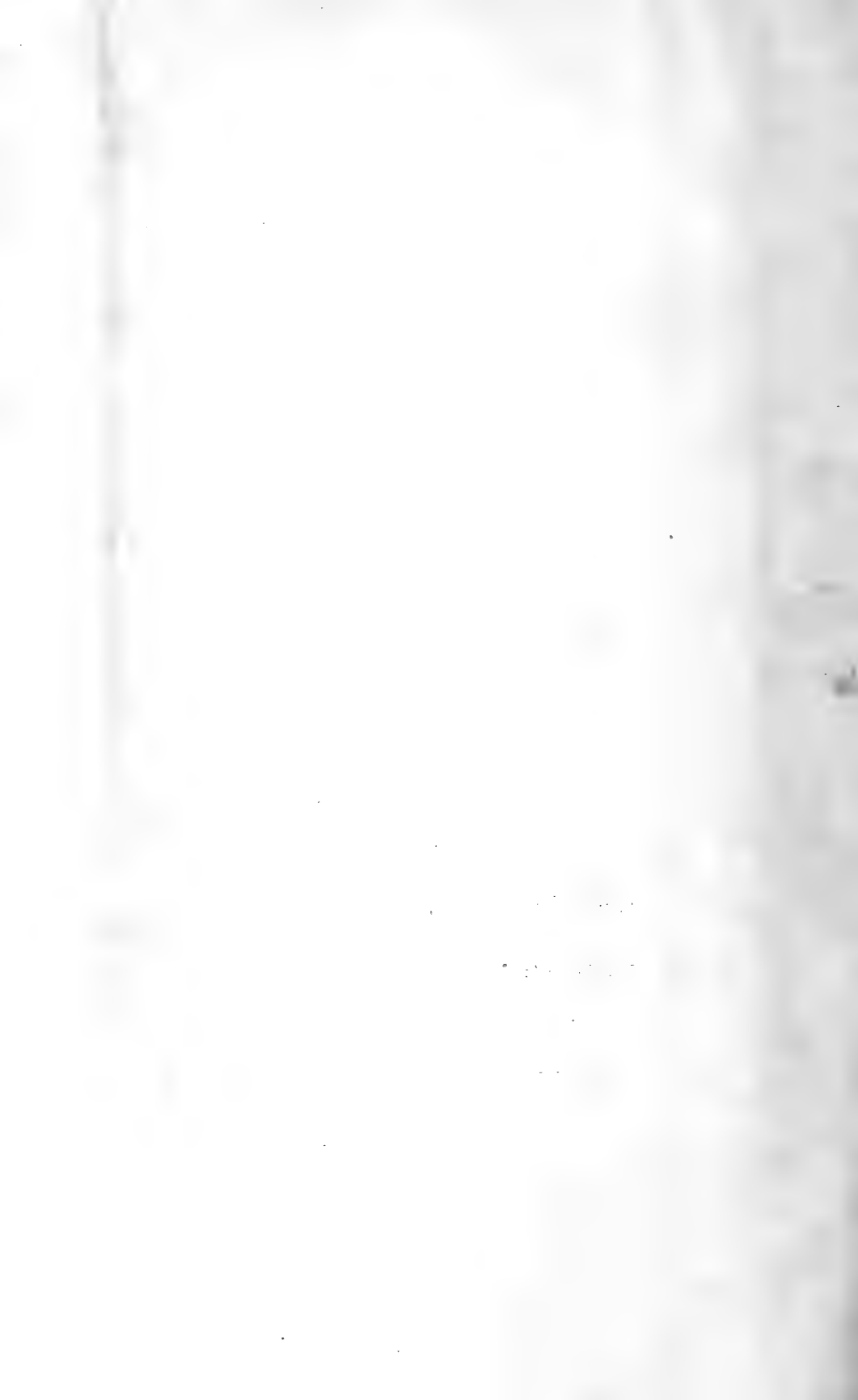


B.

Trenton limestone, Pointe Bleue, shore of lake St. John, showing undisturbed strata.



Sketch Map of the Lake St. John-Saguenay District.



Transactions of The Royal Society of Canada

SECTION IV

SERIES III

MARCH 1917

VOL. X

Bibliography of Canadian Geology for 1915.

By WYATT MALCOLM, M.A.

Presented by R. G. McCONNELL, B.A., F.G.S.A.

(Read by title, May meeting, 1916.)

Serials Consulted.

- Academy of Natural Sciences of Philadelphia: Proceedings, vol. 66, part 3, vol. 67, parts 1-2; Journal, 2nd ser., vo. 16, part 2, Philadelphia.
- Alpine Journal, vol. 29, London, England.
- American Academy of Arts and Sciences: Proceedings, vol. 50, nos. 6-13; vol. 51, nos. 1-9. Boston, Mass.
- American Ceramic Society: Transactions, vol. 17. Columbus, Ohio.
- American Geographical Society: Bulletin, vol. 47. New York.
- American Institute of Mining Engineers: Bulletins, nos. 97-108; Transactions, vols. 45-50. New York.
- American Journal of Science, 4th ser., vols. 39, 40. New Haven.
- American Museum of Natural History: Journal, vol. 15; Bulletin, vol. 34. New York.
- American Peat Society: Journal, vol. 8. Toledo, Ohio.
- American Philosophical Society: Proceedings, vol. 54, nos. 216-220. Philadelphia, Pa.
- Annals and Magazine of Natural History, vols. 15-16. London, Eng.
- Appalachia, vol. 13, nos. 3-4. Boston, Mass.
- Applied Science, vol. 9, nos. 9-12, vol. 10, nos. 1-4. Toronto, Ont.
- Association of American Geographers: Annals, vol. 4. Washington, Conn.
- Association of Ontario Land Surveyors: Annual Report, vol. 30. Toronto, Ont.
- Boston Society of Natural History: Proceedings, vol. 35, nos. 2-3; Occasional Papers VII, Fauna of New England 13. Boston, Mass.
- British Association for the advancement of Science: Report of the 84th meeting, 1914. London, England.
- British Columbia Academy of Science: Papers read before (1910-1913). Vancouver, B.C.
- British Columbia Bureau of Mines: Annual Report for 1914; Bulletins 1-4. Victoria, B.C.
- Buffalo Society of Natural Sciences: Bulletin, vol. 11, no. 1. Buffalo, N.Y.
- Canada, Department of Mines, Geological Survey: Summary Reports 1913 and 1914; Memoirs 34, 46, 50, 56-60, 62-82; Museum Bulletins 6, 9-21. Ottawa.

- Canada, Department of Mines, Mines Branch: Summary Reports 1913 and 1914; Bulletins 9-10; (Publications) nos. 279, 281, 291, 299, 305, 309, 315, 317-320, 322, 323, 325, 331, 333, 334, 344, 348, 349, 356, 383. Ottawa.
- Canadian Alpine Journal, vol. 6. Banff, Alta.
- Canadian Engineer, vols. 28-29. Toronto.
- Canadian Mining Institute: Transactions, vol. 17; Bulletin, nos. 33-44. Montreal.
- Canadian Mining Journal, vol. 36. Toronto.
- Canadian Record of Science, vol. 9, nos. 6-7. Montreal.
- Canadian Society of Civil Engineers: Transactions, vol. 28, part 2, vol. 29, part 1. Montreal.
- Carnegie Museum: Annals, vol. 9, nos. 3-4; Memoirs, vol. 6, no. 7. Pittsburg, Pa.
- Coal Age, vols. 7-8. New York.
- Colliery Engineer, vol. 35, nos. 6-12, vol. 36, nos. 1-3. Scranton, Pa.
- Economic Geology, vol. 10. Lancaster, Pa.
- Engineering Magazine, vol. 48, nos. 4-16, vol. 49, vol. 50, nos. 1-3. New York.
- Engineering and Mining Journal, vols. 99-100. New York.
- Geographical Journal, vols. 45-46. London, England.
- Geographical Society of Philadelphia: Bulletin, vol. 13. Philadelphia, Pa.
- Geological Magazine, new series, decade 6, vol. 2. London, England.
- Geological Society of America: Bulletin, vol. 26. New York.
- Geologists' Association: Proceedings, vol. 26. London, England.
- Harvard College, Museum of Comparative Zoology: Bulletin, vol. 55, no. 4, vol. 59, nos. 1-8; Memoirs, vol. 46, no. 1, vol. 42. Cambridge, Mass.
- Imperial Institute: Bulletin, vol. 13. London, England.
- Industrial Advocate, vol. 20, nos. 3-12; vol. 21, nos. 1-2. Halifax.
- Institution of Mining Engineers: Transactions, vol. 48, parts 2-5, vol. 49, vol. 50, part 1. London, England.
- Journal of Geology, vol. 23. Chicago.
- Lake Superior Mining Institute: Proceedings, vol. 20. Ishpeming, Mich.
- Maritime Mining Record, vol. 17, nos. 13-24, vol. 18, nos. 1-12. Stellarton, N.S.
- Michigan Academy of Science: Fifteenth Report. Lansing, Mich.
- Michigan Geological and Biological Survey: Publications 14, 16-18. Lansing, Mich.
- Mineralogical Magazine, vol. 17, nos. 80-81. London, England.
- Mining and Engineering World, vols. 42-43. Chicago.
- Mining, Engineering, and Electrical Record, vol. 20, nos. 1-9. Vancouver, B.C.
- Mining Journal, vols. 108-111. London, England.
- Mining Magazine, vols. 12-13. London, England.
- Mining and Scientific Press, vols. 110-111. San Francisco.
- National Academy of Sciences: Proceedings, vol. 1. Washington, D.C.
- Naturaliste Canadien, vol. 41, nos. 7-12; vol. 42, nos. 1-6. Quebec.
- Nature, vol. 94, p. 499 to vol. 96, p. 502. London, England.
- New York Academy of Sciences: Annals, vol. 24, pp. 171-443, vol. 26, pp. 1-170. New York.
- New York State Museum: Bulletin, nos. 174-180. Albany, N.Y.
- Nova Scotian Institute of Science: Proceedings and Transactions, vol. 13, parts 3 and 4; vol. 14, part 1. Halifax.
- Nova Scotia, Department of Public Works and Mines: Annual Report of the Mines, 1914.
- Ontario Bureau of Mines: Annual Report, vol. 24, parts 1-3; Bulletin 23-25. Toronto.
- Ottawa Naturalist, vol. 28, nos. 10-12; vol. 29, nos. 1-9. Ottawa.

- Quarterly Journal of the Geological Society, vol. 70, part 4, vol. 71, part 1. London, England.
- Quebec, Department of Colonization, Mines and Fisheries, Mines Branch: Report on Mining Operations, 1914; Copper deposits of the Eastern Townships.
- Royal Canadian Institute: Transactions, vol. 10, part 2. Toronto.
- Royal Society of Canada: Proceedings and Transactions, 3rd series, vol. 8, sec. 1-2 pp. 215-452, sec. 3 pp. 121-188, sec. 4, pp. 99-350; vol. 9, sec. 1-2, pp. 1-448, sec. 3, pp. 1-194, sec. 4, pp. 1-249. Ottawa.
- School of Mines Quarterly, vol. 36, nos. 1-4. New York.
- Science, new series, vol. 41-42. New York.
- Science Conspectus, vol. 5. Boston, Mass.
- Smithsonian Institution: Annual Report, 1914; Miscellaneous Collections vol. 65, nos. 1-8, 10, 11, 13. Washington.
- Société de Géographie de Québec: Bulletin, vol. 9. Quebec.
- United Empire, vol. 6. London, England.
- United States National Museum: Bulletin nos. 71 part 5, 82, 88, 90-92; Proceedings, vol. 47, pp. 565-729, vol. 48 pp. 59-114, 195-672, vol. 49, pp. 1-586, 591-616. Washington.
- Washington Academy of Sciences: Journal, vol. 5. Washington, D.C.

BIBLIOGRAPHY.

ADAMS, FRANK D.

1. Memoir of Alfred Ernest Barlow. Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 12-18, 1 pl., March, 1915.
2. Our mineral resources and the problem of their proper conservation. Canada, Commission of Conservation, Rept. of the Sixth Ann. Meeting, pp. 52-69, 1915.
3. Our mineral resources and the problem of their proper conservation. Can. Min. Inst., Bull. 35, pp. 133-153, March, 1915.
4. Problems of the Sanadian Shield. Problems of American Geology, pp. 43-80, 5 pls., 1 diag. Yale University Press, New Haven, 1915.

ADAMS, FRANK D., and DICK, W. J.

Discovery of phosphate of lime in the Rocky mountains. Canada Commission of Conservation, 36 pp., 9 pls., 3 maps, 1915.

ADAMS, L. D.

The Weedon or McDonald copper mine. Can. Min. Inst., Bulletin 34, pp. 51-62, February, 1915.

ALCOCK, F. J.

Geology of the north shore of Lake Athabaska, Alberta and Saskatchewan. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 60-61, 1915.

ALLAN, JOHN A.

1. National parks in the Canadian Cordillera, physical features and some of the many attractions in the Canadian national playgrounds situated in the western mountains. Science Conspectus, vol. 5, no. 5, pp. 113-125, 9 figs., 1915.

2. Rocky Mountains park, Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Report, 1914, pp. 42-43, 1915.

ALLEN, R. C.

Discussion of correlations. See Leith and Allen.

ALLEN, R. C and BARRETT, L. P.

1. Contributions to the Pre-Cambrian geology of northern Michigan and Wisconsin. Mich. Geol. and Biol. Surv. Publication 18, Geol. Ser. 15, pp. 1-164, 12 pls., 11 figs., 1915.
2. A revision of the sequence and structure of the pre-Keweenaw formations of the eastern Gogebic iron range of Michigan. Jour. Geol., vol. 23, no. 8, pp. 689-702, 2 figs., November-December, 1915.

AMI, HENRY M.

1. Canada and Newfoundland. Stanford's compendium of geography and travel (new issue). North America, vol. 1 (2nd edition, revised), XXVIII and 1069 pp. 161 illustrations, 161 maps. London, Edward Stanford, Ltd., 1915.
2. Corundum in Ontario. Can. Min. Inst., Bull. no. 40, pp. 572-572, August, 1915.
3. The Royal Society of Canada. Science, new ser., vol. 42, pp. 465-470, October 1, 1915.

ANDERSEN, OLAF.

On aventurine feldspar. Am. Jour. Sc., ser. 4, vol. 40, pp. 351-399, illustrations, October, 1915.

ANONYMOUS.

1. The working of asbestos. Can. Eng., vol. 29, no. 15, pp. 450-451, October 7, 1915.
2. Athabasca river. Mine, Quarry and Derrick, vol. 1, no. 5, pp. 153-154, March 31, 1915.
3. Prof. Manley B. Baker, Member of Council. Can. Min. Inst., Bull. no. 38, pp. 377-378, June, 1915.
4. British Columbia mines and the war. Min. Jour., vol. 108, pp. 207-208, March 27, 1915.
5. Canoe routes and geological features of Kowkash district, Ontario. Can. Min. Jour., vol. 36, no. 18, pp. 556-560, 5 figs., Sept 15, 1915.
6. Present conditions at Cobalt and Porcupine. Can. Min. Jour., vol. 36, pp. 231-232, 1 fig., April 15, 1915.
7. Mr. Theophile Denis, Superintendent of Mines for Quebec. Can. Min. Inst., Bull. no. 40, pp. 557-558, 1 fig., August, 1915.
8. Diatomite from Nova Scotia. Bull. of Imp. Inst., vol. 13, no. 3, pp. 384-385, July-September, 1915.
9. The new discovery. Maritime Mining Record, vol. 18, no. 12, pp. 11-12, December 22, 1915.
10. Mr. D. B. Dowling, Member of Council. Can. Min. Inst., Bull. no. 38, pp. 375-376, 1 fig., June, 1915.
11. The Dundee mine, Ymir, B.C. Min., Eng., and Electrical Record, vol. 20, no. 1, pp. 5-6, April 1, 1915.

12. Edmonton demonstration pavement—with Canadian asphalt.—*Can. Eng.* vol. 29, no. 11, p. 362, 2 figs., September 9, 1915.
13. Field operations of the Geological Survey in 1915. *Can. Min. Jour.*, vol. 36, no. 11, pp. 337-338, June 1, 1915; *Can. Min. Inst.*, Bull. no. 38, pp. 420-424, June, 1915; *Min., Eng., and Electrical Record*, vol. 20, no. 5, pp. 106-108, July, 1915.
14. A geologist as a conservationist. *Can. Min. Inst.*, Bull. 42, pp. 743-744, October, 1915.
15. Gold. *Can. Min. Jour.*, vol. 36, no. 17, pp. 521-523, 4 figs., September 1, 1915.
16. Mr. Thomas Graham. *Can. Min. Inst.*, Bull. no. 40, pp. 559-560, 1 fig., August, 1915.
17. Le Pas district in Manitoba. *Eng. and Min. Jour.*, vol. 100, no. 22, p. 874, November 27, 1915.
18. Mr. James McEvoy. *Can. Min. Inst.*, Bull. no. 39, pp. 480-481, 1 fig., July, 1915.
19. Magnesite deposits of Atlin. *Min., Eng., and Electrical Record*, vol. 20, no. 5, pp. 120-121, July, 1915.
20. Magnesite discovered in British Columbia. *Eng. and Min. Jour.*, vol. 100, no. 10, p. 384, September 4, 1915.
21. Oil prospects in Alberta. *Min. Jour.*, vol. 111, p. 845, December 11, 1915.
22. Quatsino Copper Company, Limited. *Min., Eng., and Electrical Record*, vol. 20, no. 2, pp. 35-36, April 15, 1915.
23. Rich ore at the Temiskaming mine. *Eng. and Min. Jour.*, vol. 99, no. 25, p. 1085, 1 fig., June 19, 1915.
24. Alleged silver discovery at Fond du Lac. *Can. Min. Inst.*, Bull. 41, p. 653, September, 1915; *Can. Min. Jour.*, vol. 36, no. 17, p. 520, September 1, 1915.
25. The occurrence and utilisation of zinc ores. *Imperial Institute, Bull.*, vol. 13, no. 4, pp. 611-634, October-December, 1915.
26. Alfred Ernest Barlow. *Roy. Soc. Can.*, Proceedings for 1915, 3rd ser., vol. 9, pp. XII-XVI, 1 pl., 1915.

ARNOLD, RALPH.

Report on the oil possibilities of the Flathead district, B.C. *British Columbia, Minister of Mines, Ann. Rept.*, for 1914, pp. 238-242, 1 pl., 1915.

ASHLEY, G. H.

1. The physiography of the Rockies in the Cretaceous-Tertiary period. Abstract: *Wash. Acad. Sc. Jour.*, vol. 5, no. 9, p. 332, May 4, 1915.
2. Physiographic study of the Cretaceous-Eocene period in the Rocky Mountain front and great plain provinces. Abstract: *Science*, new ser., vol. 41, p. 510, April 2, 1915.

ASTLEY, J. W.

Nanaimo mining division. *British Columbia, Minister of Mines, Ann. Rept.* for 1914, pp. 379-385, illus., 1915.

BAILEY, IRVING W.

The evolution of herbaceous plants and its bearing on certain problems of geology and climatology. See Sinnott and Bailey.

BAIN, H. FOSTER.

Mines and mining (on the Pacific coast). *Nature and Science of the Pacific Coast*, pp. 65-74, 4 figs. Paul Elder and Company, San Francisco.

BAKER, HOWARD B.

Origin of continental forms. *Mich. Acad. Sc.*, 15th Rept., pp. 26-32, 107-109, 4 figs., 1913.

BANCROFT, J. AUSTEN.

Report on the copper deposits of the Eastern Townships of the province of Quebec. Quebec, Dept. of Colonization, Mines and Fisheries, Mines Branch, 295 pp., 9 pls., 10 figs., 1 map, 1915.

BANKS, CHARLES A.

Beaver Lake district, Saskatchewan. *Min. and Sc. Press*, vol. 110, no. 25, p. 954, 1 fig., June 19, 1915.

BARLOW, Alfred Ernest.

Corundum, its occurrence, distribution, exploitation, and uses. Canada, Dept. of Mines, Geol. Surv., *Memoir* 57, 377 pp., 28 pls., 1 fig., 2 maps, 1915.

BARRELL, JOSEPH.

Factors in movements of the strand line and their results in the Pleistocene and post-Pleistocene. *Am. Jour. Sc.*, 4th ser., vol. 40, pp. 1-22, July, 1915; Abstract: *Wash. Acad. Sc.*, *Jour.* vol. 5, no. 12, pp. 413-420, June 19, 1915.

BARRETT, L. P.

1. Contributions to the Pre-Cambrian geology of northern Michigan and Wisconsin. See Allen and Barrett.
2. A revision of the sequence and structure of the pre-Keweenaw formations of the eastern Gogebic iron range of Michigan. See Allen and Barrett.

BARTLETT, JAMES.

1. Gold discovery near Dryden. *Can. Min. Jour.*, vol. 36, no. 23, p. 711, December, 1915.
2. Mines of Ontario. See Sutherland, Collins, McMillan and Bartlett.

BASCOM, F.

Magmatic assimilation. Abstract: *Geol. Soc. Am.*, *Bull.*, vol. 26, no. 1, p. 82, March, 1915.

BASSLER, RAY S.

Bibliographic index of American Ordovician and Silurian fossils. U.S. National Museum, *Bull.* 92, in two volumes, 1521 pp., 4 pls., 1915.

BATESON, W. R.

Gold strike at Montague mines. *Can. Min. Jour.*, vol. 36, no. 19, p. 588, October 1, 1915.

BATHER, F. A.

Studies in *Edrioasteroidea*, VII. Morphology and bionomics of the *Edrioasteroidea*. Geol. Mag., decade 6, vol. 2, pp. 211-215, 259-266, 316-322, 393-403, 5 figs., 1915.

BAUER, CLYDE MAXWELL.

A sketch of the late Tertiary history of the upper Missouri river. Jour. Geol., vol. 23, no. 1, pp. 52-58, 1 fig., January-February, 1915.

BATEMAN, G. C.

Fond du Lac silver strike. Eng. and Min. Jour., vol. 99, no. 18, p. 787, May 1, 1915.

BELL, W. A.

The Horton-Windsor Carboniferous area, Nova Scotia. Canada, Dept. of Mines, Geol. Sur., Summary Rept., 1914, pp. 106-107, 1915.

BERRY, EDWARD WILBER.

Palaeobotanic evidence of the age of the Morrison formation. Geol. Soc. Am., Bull., vol. 26, no. 3, pp. 335-342, September, 1915.

BLIZARD, JOHN.

1. Results of the investigation of six lignite samples obtained from the province of Alberta. See Haanel and Blizard.
2. Results of investigations of five lignite samples obtained from the Province of Alberta. See Haanel and Blizard.

BOSWORTH T. O.

1. Discussion of paper by E. H. Cunningham Craig on "The prospective oil fields of Western Canada." Jour. Inst. Petroleum Technologists, vol. 1, part 3, pp. 139-142, March, 1915.
2. The oil fields of western Canada. Petroleum World, vol. 12, pp. 85-92, 7 figs., February, 1915.
3. The prospective oil fields of western Canada. Petroleum Review, vol. 32, pp. 123-124, February 6, 1915.

BOWEN, C. F.

The stratigraphy of the Montana group with special reference to the position and age of the Judith River formation in north-central Montana. U.S. Geol. Surv., Professional Paper 90, pp. 95-153, 1 map. 1915.

BOYLE, R. W. and TORY, H. M.

A physical test on a natural (methane) gas well. Roy. Soc. Can., Trans. 3rd ser., vol. 9, sec. 3, pp. 139-145, 4 figs., December, 1915.

BRANSON, E. B.

Origin of thick gypsum and salt deposits. Geol. Soc. Am., Bull., vol. 26, pp. 231-242, 5 figs., June 28, 1915.

BREWER, W. M.

1. The mineral resources of the Atlin mining division. British Columbia Bureau of Mines, Bulletin no. 2, 1915, 24 pp., illus., 1915; British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 82-99, 1915.

2. The mineral resources of the Skeena mining division and portions of the Omineca and Queen Charlotte divisions. British Columbia Bureau of Mines, Bulletin no. 3, 1915, 56 pp. illus., 1915; British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 101-150, 164-169, 1915.
3. The Omineca Mining Division, British Columbia. Mining Press, vol. 110, no. 12, pp. 443-444, 2 figs., March 20, 1915.

BROCK, R. W.

1. A British Columbia example of the contact metamorphism of a granite rock to a garnet. Roy. Soc. Can., Trans., ser. 3, vol. 9, sec. 4, pp. 175-180, 3 pls., September, 1915; Abstract: Science, new ser., vol. 42, p. 468, October 1, 1915.
2. Notes on some hitherto unrecorded occurrences in British Columbia, of uncommon minerals, collected by the late W. J. Sutton of Victoria. Roy. Soc. Can., Trans., ser. 3, vol. 9, sec. 4, pp. 119-120, September, 1915; Abstract: Science, new ser., vol. 42, p. 468, October 1, 1915.
3. Sources of mineral wealth of British Columbia. Min. and Eng. World, vol. 43, no. 4, p. 144, July 24, 1915.
4. Summary Report of the Geological Survey, Department of Mines, for the calendar year 1913. Canada, Dept. of Mines, Geol. Surv. (Publication), 1359, 417 pp., illustrated with maps, diagrams and figures, 1914.

BROWN, BARNUM.

1. Cretaceous reptilian life in Alberta. Mine, Quarry and Derrick, vol. 1, no. 2, pp. 38-39, 1 fig., February 17, 1915.
2. *Corythosaurus*, the new duck-billed dinosaur. See Matthew and Brown.

BRUCE, E. L.

Amisk Lake district, northern Saskatchewan and Manitoba. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 67-69, 1915.

BRUNTON, S.

Investigation of the occurrence of radio-active minerals in Ontario. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 91-94, 1915.

BUCHAN, J. S.

Mount Royal once an active volcano. Can. Rec. Sc., vol. 9, no. 6, pp. 338-345, 2 figs., 1914.

BURLING, LANCASTER D.

1. Report (on field and office work). Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 314-321. 1914.
2. Shallow water deposition in the Cambrian of the Canadian cordillera. Ottawa Naturalist, vol. 29, no. 8, pp. 87-88, November, 1915.
3. Structural relations of the Pre-Cambrian and Palaeozoic rocks north of the Ottawa and St. Lawrence valleys. See Kindle and Burling.

BURROWS, A. G.

The Porcupine gbl'd area. Ontario Bureau of Mines, 24th Ann. Rept. Part 3, pp. 1-57, illus., 2 maps, 1915.

BURROWS, A. G. and HOPKINS, P. E.

The Kamiskotia Lake area. Ontario Bureau of Mines, 24th Ann. Rept., Part 3, pp. 58-60, 2 figs., 1915.

BURWASH, EDWARD M.

1. The Pleistocene volcanoes of the Coast range of British Columbia. B. C. Acad. Sc. Papers, 1910-1913, pp. 67-75, 3 figs., 1 map. 1914.
2. A review of British Columbia geology. B.C. Acad. Sc. Papers, 1910-1913, pp. 61-66, 1914.

CADMAN, JOHN.

Discussion of paper by E. H. Cunningham Craig on "The prospective oilfields of Western Canada." Jour. Inst. Petroleum Technologists, vol. 1, part 3, pp. 142-143, March, 1915.

CAIRNES, D. D.

1. Chisana goldfields. Can. Min. Inst., Trans., vol. 17, pp. 11-32, 18 pls., 1 map, 1915.
2. Exploration in southwestern Yukon. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 10-33, 1 diag., 1915.
3. The lime belt, Quadra (South Valdes) island, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Report, 1913, pp. 58-75, 1 map. 1914.
4. Upper White River district, Yukon. Canada, Dept. of Mines, Geol. Surv. Summary Rept., 1913, pp. 12-28, 1 fig., 1914.
5. Upper White River district, Yukon. Canada, Dept. of Mines, Geol. Surv., Memoir 50, 191 pp., 17 pls., 2 figs., 3 maps, 1915.
6. The Yukon-Alaska international boundary, between Porcupine and Yukon rivers. Canada, Dept. of Mines, Geol. Surv., Memoir 67, 161 pp., 16 pls., 2 figs., 2 maps, 1914.

CAMERON, A. E.

Some notes on the extraction of gold from the Saskatchewan River gravels. Mine, Quarry and Derrick, vol. 1, no. 5, pp. 152-153, March 31, 1915.

CAMPBELL-JOHNSTON, RONALD C.

1. Nature's electrical deposition of metals. Min. Jour., vol. 110, 496-497, 548, 1915.
2. Suggested origin of the petroleum occurring in western Canada. Min. Jour., vol. 108, pp. 183-184, March 13; pp. 205-206, March 20, 1915.

CAMSELL, CHARLES.

1. An exploration of the region between Athabaska and Great Slave lakes, Alberta and North West Territories. Canada, Dept. of Mines, Geo. Surv., Summary Rept., 1914, pp. 55-60, 1915.
2. Guide to the geology of the Canadian National Parks on the Canadian Pacific Railway between Calgary and Revelstoke, 70 pp., illus., Dept. of the Interior, Ottawa, 1914.
3. The Mackenzie River region. Science Conspectus, vol. 5, no. 1, pp. 1-9, 8 figs., 1 map, 1915.
4. Notes on mining developments in Similkameen district, B.C., and on a reported occurrence of oil at Kelowna, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 127-128, 1914.

CANADIAN MINING JOURNAL.

1. The discovery of corundum in Ontario. *Can. Min. Jour.*, vol. 36, no. 16, pp. 485-486, Aug. 15, 1915.
2. Important gold discoveries in Ontario. *Can. Min. Jour.*, vol. 36, no. 18, pp. 549-550, September 15, 1915.
3. Persistence of ore in depth. *Can. Min. Jour.*, vol. 36, no. 18, pp. 550-551, September 15, 1915.
4. Porcupine ores and rocks. *Can. Min. Jour.*, vol. 36, no. 11, p. 326, June 1, 1915.

CAPPS, STEPHEN R.

1. An ancient volcanic eruption in the upper Yukon basin. *U. S. Geol. Surv. Prof. Paper* 95, pp. 59-64, 1 pl., 1 fig., 1915.
2. An estimate of the age of the last great glaciation in Alaska. *Wash. Acad. Sc.*, vol. 5, no. 4, pp. 108-115, 4 figs., February 19, 1915.

CARTWRIGHT, COSMO T.

The production of copper, gold, lead, nickel, silver, zinc, and other metals in Canada during the calendar year 1913. Canada, Dept. of Mines, Mines Branch, (Publication) 317, 77 pp., 1914.

CASE, E. C.

The Permo-Carboniferous red beds of North America and their vertebrate fauna. Carnegie Institution of Washington, Publication 207, 176 pp., 24 pls., 50 figs., 1915.

CHADWICK, GEORGE H.

Post-Ordovician deformation in the Saint Lawrence valley, New York. *Geol. Soc. Am., Bull.*, vol. 26, pp. 287-294, 9 figs., June 30, 1915.

CHAMBERS, ERNEST J.

The unexploited West, 361 + 8 + 11 pp., illus. Canada, Dept. of the Interior, Railway Lands Branch, Ottawa, 1914.

CLAPP, CHARLES H.

1. Alunite and pyrophyllite in Triassic and Jurassic volcanics at Kyuquot sound, British Columbia. *Econ. Geol.*, vol. 10, no. 1, pp. 70-88, 1 fig., January, 1915.
2. The geology of the alunite and pyrophyllite rocks of Kyuquot sound, Vancouver island. Canada, Dept. of Mines, Geol. Surv., Summary Report, 1913, pp. 109-126, 1 map. 1914.
3. Deformation of the coast region of British Columbia. Abstract: *Geol. Soc. Am., Bull.*, vol. 26, no. 4, pp. 406-407, December, 1915.
4. Sharp Point hot spring, Vancouver island, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 80-83, 1914.

CLAPP C. H. and COOKE, H. C.

Geology of a portion of the Duncan map-area, Vancouver island, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Report, 1913, pp. 84-105, 1914.

CLAPP, FREDERICK G. and others.

Petroleum and natural gas resources of Canada, in two volumes. Canada, Dept. of Mines, Mines Branch, (Publication) no. 291; vol. 1, 378 pp., 21 pls., 25 figs., 1 map; vol. 2, 404 pp., 12 pls., 23 figs., 3 maps, 1915.

CLARKE, F. W.

Analyses of rocks and minerals from the laboratory of the United States Geological Survey, 1880-1914. U. S. Geol. Surv., Bull. 581, 376 pp., 1915.

CLARK, JOHN M.

1. Causes producing scratched, impressed, fractured and recemented pebbles in ancient conglomerates. Abstract: Science, new ser., vol. 41, p. 509, April 2, 1915; Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, p. 60, March, 1915.
2. Conceptions regarding the American Devonian. N. Y. State Mus., Bull. 177, pp. 115-133, 1915.
3. Discussion of paper by Sidney Powers on "Acadian Triassic." Geol. Soc. Am., Bull., vol. 26, no. 1, p. 94, 1915.
4. The Hugh Miller cliffs. N. Y. State Mus., Bull. 177, pp. 25-26, 1915.
5. Logan Park. N. Y. State Mus., Bull., 177, pp. 23-25, 1915.
6. The Oriskany—Pic d'Aurore episode of the Appalachian Devonian. N. Y. State Mus., Bull. 177, pp. 147-153, 1 pl., 1 fig., 1915.
7. Type of refted relict mountain, or rift-mountain. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, p. 90, March, 1915.
8. The rifted relict mountain, a type of "old red" orogeny. N. Y. State Mus., Bull. 177, pp. 155-161, 2 pls., 3 figs., 1915.

CLEVENGER, G. H.

Note upon the occurrence of mercury in Cobalt ores. Econ. Geol., vol. 10, no. 8, pp. 770-773, December, 1915.

COLE, ARTHUR A.

The mining industry in that part of northern Ontario served by the Timiskaming and Northern Ontario railway, calendar year 1914, 73 pp., illustrations. Timiskaming and Northern Ontario Railway Commission, Toronto, 1915.

COLE, L. HEBER.

1. Investigation of the sand areas of the province of Quebec. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, p. 60, 1915.
2. Report on the salt deposits of Canada and the salt industry. Canada, Dept. of Mines, Mines Branch, (Publication) 325, 160 pp., 26 pls., 25 figs., 4 maps, 1915.
3. Saline springs of Manitoba. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 50-53, 1914.

COLEMAN, A. P.

1. The climatic conditions of the early Pre-Cambrian. Br. Ass. Adv. Sc., Rept. of 84th meeting, p. 359, 1915.
2. Discussion of paper by Dr. Howe entitled "Petrographic notes on the Sudbury nickel deposits." Econ. Geol., vol. 10, no. 4, pp. 390-393, June, 1915.

3. Glaciers of the Rockies and Selkirks. Can. Min. Jour., vol. 36, no. 12, pp. 361-366, 6 figs., June 15, 1915.
4. Length and character of the earliest inter-glacial period. Geol. Soc. Am., Bull., vol. 26, pp. 243-254, 3 figs., June 28, 1915.
5. The Proterozoic of the Canadian Shield and its problems. Problems of American Geology, pp. 81-161, 15 figs., Yale University Press, New Haven, 1915.
6. Radio-activity and the earth's thermal history, a criticism. Geol. Mag., decade 6, vol. 2, no. 6, pp. 273-274, June, 1915.

COLLINS, E. A.

Mines of Ontario. See Sutherland, Collins, McMillan and Bartlett.

COLLINS, W. H.

1. Geology of a portion of Sudbury map-area, south of Wanapitei lake, Ontario. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 189-195, 1 map, 1914.
2. A reconnaissance of the north shore of Lake Huron. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 81-82, 1915.

COOKE, H. C.

1. Geology of a portion of the Duncan map-area, Vancouver island, B.C. See Clapp and Cooke.
2. The basins of the Nottaway and Broadback rivers, northwestern Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, p. 95, 1915.
3. Geology of the Sooke special map-area, Vancouver island, B. C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 106-108, 1914.

CORLESS, C. V.

Ore in sight. Min. and Metallurgical Soc. of Am., Bull. 88, pp. 213-215, Sept. 30, 1915; Can. Min. Inst., Bull. 42, pp. 760-764, October, 1915.

COSTE, EUGENE:

Rock disturbances theory of petroleum emanations vs. the anticlinal or structural theory of petroleum accumulations. Am. Inst. Min. Eng., Trans. vol. 48, pp. 504-520, 1915.

CRAIG, E. H. CUNNINGHAM.

1. The Alberta oil fields. Reprinted from "Petroleum World" by Mine, Quarry and Derrick, vol. 1, no. 1, pp. 28-29, February 3, 1915.
2. The prospective oil fields of Western Canada. Jour. Inst. Petroleum Technologists, vol. 1, part 3, pp. 127-145, March, 1915.

CROWELL and MURRAY.

The iron ores of Lake Superior. 257 pp., illus., maps. D. Van Nostrand Company, New York, 1914.

CUMMING, C. L.

Artesian wells of Montreal. Canada, Dept. of Mines, Geol. Sur., Memoir 72, 153 pp., 1 pl., 5 figs., 1 map, 1915.

CUSHING, H. P.

1. Age of the igneous rocks of the Adirondack regions. *Am. Jour. Sc.*, vol. 39, pp. 288-294, March, 1915.
2. Discussion of paper by Miller and Knight on "Revision of Pre-Cambrian classification in Ontario." *Geol. Soc. Am., Bull.*, vol. 26, no. 1, p. 88, March, 1915.

DALE, NELSON C.

The Cambrian manganese deposits of Conception and Trinity bays, Newfoundland. *Am. Phil. Soc., Proc.*, vol. 54, no. 220, pp. 371-456, 47 figs., October-December, 1915.

DALY, REGINALD ALDWORTH.

1. A geological reconnaissance between Golden and Kamloops, B.C., along the Canadian Pacific railway. Canada, Dept. of Mines, *Geol. Surv.*, Memoir 68, 260 pp., 46 pls., 4 figs., 7 maps, 1915.
2. The glacial-control theory of coral reefs. *Am. Acad. Arts and Sc., Proc.*, vol. 51, no. 4, pp. 157-251, illus., November, 1915.

DARLING, S. M.

The carbonizing and briquetting of lignite. Board of Highway Commissioners, Government of the Province of Saskatchewan, 48 pp., illus., Regina, 1915.

DAVIS, N. B.

1. Metal oxide and sulphide impregnation of fire-brick. *Econ. Géol.*, vol. 10, no. 7, pp. 663-675, 4 pls., 1 fig., November-December, 1915.
2. The plasticity of clay and its relation to mode of origin. *Am. Inst. Min. Eng., Bull.* 98, pp. 301-330, February, 1915.
3. The plasticity of clay. *Am. Ceramic Soc., Trans.*, vol. 16, pp. 65-79, 2 figs, 1914.
4. The effect of lime on certain cracking clays. *Am. Ceramic Soc., Trans.*, vol. 17, pp. 497-504, 1 fig., 1915.

DECKER, CHARLES E.

Preliminary paper on recent crustal movement in the Lake Erie region. Abstract: *Geol. Soc. Am., Bull.*, vol. 26, no. 1, p. 66, March, 1915.

DELURY, JUSTIN S.

The principles underlying the occurrence of oil and gas and their application to western Canada. *Can. Min. Jour.*, vol. 36, no. 11, pp. 331-333, June 1, 1915.

DENIS, THEO. C.

1. Preliminary statement of the mineral production in the Province of Quebec during 1914, 7 pp. Quebec Dept. of Colonization, Mines and Fisheries, Mines Branch, 1915.
2. Report on mining operations in the province of Quebec during the year 1914, 151 pp. Quebec Department of Colonization, Mines and Fisheries, Mines Branch, Québec, 1915.

DE SCHMID, HUGH S.

1. Investigation of miscellaneous non-metallic minerals. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, pp. 53-59, 1915.
2. White mica occurrences in the Tête Jaune Cache and Big Bend districts of British Columbia. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 42-49, 3 pls., 2 figs., 1914.

DICK, W. J.

1. Discovery of phosphate of lime in the Rocky Mountains. See Adams and Dick.
2. Phosphate in western Canada. Conservation, vol. 4, no. 10, p. 37, October, 1915.

DILLER, J. S.

The production of abbestos in 1914. U. S. Geol. Sur., Mineral Resources of the United States, Calendar Year 1914, Part 2, pp. 93-102, 1915.

DONKIN, HIRAM.

Report of the mines of Nova Scotia. Nova Scotia, Dept. of Public Works and Mines, Ann. Rept. of the Mines, 1914, 150+ XVII pp., illus., 1915.

DOWLING, D. B.

1. Coal areas in Flathead valley, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 139-141, 1 fig., 1914.
2. Coal fields and coal resources of Canada. Canada Dept. of Mines, Geol. Surv., Memoir 59, 174 pp., 9 figs., 7 maps, 1915.
3. Coal fields of British Columbia. Canada, Dept. of Mines, Geol. Surv., Memoir 69, 350 pp., 23 diags., 1 map, 1915.
4. The coal resources of the world—a summary. Can. Min. Inst., Trans. vol. 17, pp. 374-405, 8 figs., 1915.
5. Correlation and geological structure of the Alberta oil fields. Am. Inst. Min. Eng., Bull. no. 102, pp. 1355-1364, 4 figs., June, 1915.
6. The Cretaceous sea in Alberta. Roy. Soc. Can., Trans., vol. 9, (ser. 3), sec. 4, pp. 27-42, 2 figs., 11 maps, June, 1915.
7. Geological notes on the Sheep River gas and oil field, Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 142-149, 1914.
8. North Saskatchewan River coal areas, Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 150-152, 1914.
9. Southern Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 43-51, 1 diag., 1915.
10. Structural geology of the Alberta oil fields. Can. Min. Inst., Bull. 35, pp. 164-173, 2 figs., March 1915.

DRESSER, JOHN A.

Asbestos in southern Quebec. Am. Inst. Min. Eng., Trans., vol. 50. pp. 954-963, 1915.

DRYSDALE, CHARLES W.

1. Geology of Franklin mining camp, British Columbia, Canada, Dept. of Mines, Geol. Surv., Memoir 56, 246 pp., 23 pls., 16 figs., 2 maps, 1915.
2. Notes on the geology of the "Molly" molybdenite mine, Lost creek, Nelson mining division, B.C. Can. Min. Inst., Bull. 43, pp. 872-880, November, 1915.

3. Rossland mining camp, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, p. 129, 1914.
4. Geology and ore deposits of Rossland, British Columbia. Canada, Dept. of Mines, Geol. Surv., Memoir 77, 317 pp., 25 pls., 26 figs., 6 maps, 1915.
5. Ymir mining camp, West Kootenay district, British Columbia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 37-38, 1915.

DUFRESNE, A. O.

The sand-lime brick industry in the province of Quebec. Report on the mining operations in the province of Quebec during the year 1914, pp. 88-103, Quebec, 1915.

DULIEUX, P. E.

Les minerais de fer de la province de Quebec, gisements et utilisation, 243 pp., illustrations. Quebec, Department of Colonization, Mines and Fisheries, Mines Branch. Quebec, 1915.

ELLIS, HUBERT I.

Dawson, Nome and Fairbanks. Eng. and Min. Jour., vol. 99, no. 12, pp. 517-520, 7 figs., March 20, 1915.

ELLS, S. C.

1. Bituminous sands of northern Alberta. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, pp. 60-73, 1915.
2. Notes on clay deposits near McMurray, Alberta. Canada, Dept. of Mines, Mines Branch, Bulletin no. 10, 15 pp., 1915.
3. Preliminary report on the bituminous sands of northern Alberta. Canada, Dept. of Mines, Mines Branch, (Publication) no. 281, 92 pp., 55 pls., 5 figs., 1 map, 1914.
4. Summary report on bituminous sands of northern Alberta. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 54-62, 9 pls., 1 map, 1914.

EMMENS, NEWTON W.

1. Lardeau mining division, geological report on the Arrowhead section. British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 273-283, illus., 1915.
2. Mineral resources of the Trout Lake mining division. British Columbia Bureau of Mines, Bulletin no. 2, 1914, pp. 33-65, illus., 1914; British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 291-325, 1915.
3. The mineral resources of the Lardeau mining divisions. British Columbia Bureau of Mines, Bulletin no. 2, 1914, pp. 1-31, illus., 1914; British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 245-273, 1915.
4. Mineral resources of the country adjacent to Vancouver. Min., Eng., and Electrical Record, vol. 20, no. 1, pp. 17-21, no. 2, pp. 30-35, 2 figs., 1915.

FARIBAUT, E. R.

1. Caledonia map-area, Queens county, Nova Scotia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 103-106, 1915.
2. Geology of the gold district of Pleasant River barrens, Lunenburg county, N.S. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 259-263, 1 map, 1914.

3. Geology of the Port Mouton map-area, Queens county, Nova Scotia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 251-258, 1914.

FENNER, C. N.

Discussion of paper by Sidney Powers on "Acadian Triassic." Geol. Soc. Am., Bull., vol. 26, no. 1, p. 94, March, 1915.

FERRIER, W. F.

The discovery of corundum in Ontario. Can. Min. Inst., Bull. 42, pp. 765-766, October, 1915.

FIELD, RICHARD M.

On the validity of the genus *Plethopeltis* (Raymond). Ottawa Naturalist, vol. 29, nos. 3 and 4, pp. 37-43, 4 figs., June-July, 1915.

FLACHS, A.

Analysis of oil from the Dingman well. Petroleum World, vol. 12, pp. 93-94, February, 1915.

FOYE, WILBUR G.

Nephelite syenites of Haliburton county, Ontario. Am. Jour. Sc., ser. 4, vol. 40, pp. 413-436, 9 figs., October, 1915.

FRÉCHETTE, HOWELLS.

1. Investigation of the Canadian market for various mineral products in a crude, or partially prepared state. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, p. 41, 1914.
2. Limestones of the province of Quebec. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, pp. 35-53, 1 fig., 1915.
3. Report on the non-metallic minerals used in the Canadian manufacturing industries. Canada, Dept. of Mines, Mines Branch, (Publication) no. 305, 199 pp., 1914.

G.

The Quesnel valley. Mine, Quarry and Derrick, vol. 1, no. 4, pp. 119-120, 3 figs., March 17, 1915.

GALLOWAY, J. D.

1. Cariboo mining division. British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 56-71, 1915.
2. Drilling for oil at Port Haney. British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 392-396, 1915.
3. The mineral resources of a portion of the Omineca mining division. British Columbia Bureau of Mines, Bulletin no. 4, 1915, 67 pp., illus., 1915; British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 176-234, 1915.

GEIJER, PER.

Some problems in iron ore geology in Sweden and in America. Econ. Geol. vol. 10, no. 4, pp. 299-329, 2 figs., June 1915.

GEOLOGICAL SURVEY, CANADA.

The alleged silver discovery at Fond du Lac. Can. Min. Inst., Bull. 42, p. 653, September, 1915.

GIBBINS, GWYNN G.

A trip to Great Slave lake. Can. Min. Jour., vol. 30, pp. 168-171, 205-209, 13 figs., March 15 and April 1, 1915.

GIBSON, THOS. W.

1. The discovery of corundum in Ontario. Can. Min. Inst., Bull. 41, pp. 690-692, September, 1915.
2. Mineral production of Ontario for 1914. Ontario Dept. of Lands, Forests and Mines, Bureau of Mines, Bull. no. 24, 8 pp., 1915.
3. Statistical review of the mineral industry of Ontario for 1914. Ont. Bur. of Mines, Ann. Rept., vol. 24, part 1, pp. 1-65, 1915.
4. Twenty-fourth annual report of the Bureau of Mines, (Ontario) 1915, being vol. 24, part 1, 275 pp., illustrations and maps, Toronto, 1915.

GILMORE, CHARLES W.

- 1. On the fore limb of *Allosaurus fragilis*. U. S. Nat. Mus., Proc., vol. 49, pp. 501-513, 7 figs., November 27, 1915.
2. On the genus Trachodon. Science, new ser., vol. 41, pp. 658-660, April 30, 1915.
3. Some new dinosaurs. Abstract: Wash. Acad. Sc., Jour., vol. 5, no. 13, p. 488, July 19, 1915.

GOLDTHWAIT, J. W.

1. Marine submergence at Montreal, Covey hill and Rigaud mountain. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, p. 211, 1914.
2. The occurrence of glacial drift on the Magdalen islands. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin no. 14, 11 pp., 1 pl., 1 fig., 1 map, 1915.
3. Physiography and surficial geology of Nova Scotia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 244-250, 1914.
4. Physiography and surface geology of Nova Scotia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 102-103, 1915.

GRABAU, AMADEUS W.

1. North American continent in upper Devonian time. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 88-89, March, 1915; Abstract: Science, new ser., vol. 41, pp. 509-510, April 2, 1915.
2. Discussion of J. M. Clarke's paper on "Causes producing scratched, impressed, fractured, and recemented pebbles in ancient conglomerates." Geol. Soc. Am., Bull., vol. 26, no. 1, p. 61, March, 1915.

GRAY, F. W.

Coal waste in Canada and the Commission of Conservation. Can. Min. Jour., vol. 36, no. 7, pp. 221-223, April 1, 1915.

GREGORY, J. W.

The relative distribution of fiords and volcanoes. Scottish Geog. Mag., vol. 31, no. 5, pp. 257-261, 2 figs., May, 1915.

HAANEL, B. F.

Peat, lignite, and coal, their value as fuels for the production of gas and power in the by-product recovery producer. Canada, Dept. of Mines, Mines Branch, (Publication) no. 299, 261 pp., 29 pls., 39 figs., 1914.

HAANEL, B. F. and BLIZARD, JOHN.

1. Results of the investigation of five lignite samples obtained from the Province of Alberta. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 109-132, 4 pls., 7 figs., 1914.
2. Results of the investigation of six lignite samples obtained from the province of Alberta. Canada, Dept. of Mines, Mines Branch, (Publication) 331, 110 pp., 5 pls., 14 figs., 15 charts, 1915.

HAANEL, EUGENE.

1. Director's general report of the Mines Branch, Department of Mines, for the calendar year ending December 31, 1914. Summary report of the Mines Branch, Department of Mines, for the calendar year ending December 31, 1914, pp. 1-20, 1915.
2. Summary report of the Mines Branch of the Department of Mines for the calendar year ending December 31, 1913. Canada, Dept. of Mines, Mines Branch, (Publication) 285, 214 pp., 51 pls., 24 figs., 1 map, 1914.
3. The utilization of some of our non-metallic mineral resources, suggested by present conditions. Canada, Commission of Conservation, Rept. of the Sixth Ann. Meeting, pp. 34-51, 1915.

HAGGEN, E. A.

1. The Britannia mine, Howe Sound, B.C. Min., Eng., and Electrical Record, vol. 20, no. 6, pp. 129-150, 25 figs., August, 1915.
2. Malaspina marble quarries. Min., Eng., and Electrical Record, vol. 20, no. 4, p. 89, May 15 and June 1, 1915.
3. Metalliferous mining in British Columbia. Min., Eng., and Electrical Record, vol. 20, no. 5, pp. 104-106, July, 1915.
4. Mineral prospects of Indian river, B.C. Min., Eng., and Electrical Record, vol. 20, no. 7, pp. 166-168, September, 1915.
5. Placer mining in the Okanagan valley. Min., Eng., and Electrical Record, vol. 20, no. 5, pp. 114-115, July, 1915.
6. Surf Inlet mine. Min., Eng., and Electrical Record, vol. 20, no. 9, pp. 197-202, 6 figs., November and December, 1915.

HARES, C. J.

The Cannonball marine member of the Lance formation of North and South Dakota and its bearing on the Lance-Laramie problem. See Lloyd and Hares.

HARLOW, L. C.

Analyses of Nova Scotia soils. Nova Scotian Inst., Sc., Proc. and Trans., vol. 13, part 4, pp. 332-346, 1915.

HARVIE, ROBERT.

1. Brome and Missisquoi counties, Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Report, 1914, pp. 98-99, 1915.

2. Geology of Orford map-area and the southern part of the "serpentine belt," Potton township, Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 212-216, 1914.

HAYES, ALBERT O.

1. Geology of the St. John map-area, New Brunswick. Canada, Dept. of Mines, Geol. Surv., Summary Report, 1913, pp. 228-243, 1914.
2. St. John map-area, New Brunswick. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 100-101, 1915.
3. Wabana iron ore of Newfoundland. Canada, Dept. of Mines, Geol. Surv., Memoir 78, 163 pp., 28 pls., 4 figs., 1915.

HENDERSON, J. A. LEO and HENDERSON, WM. HOPE.

Inflammable natural gas as an economic mineral. Inst. Min. and Metallurgy, Bull. no. 124, 26 pp., January 14, 1915.

HENDERSON, WM. HOPE.

Inflammable natural gas as an economic mineral. See Henderson, J. A. Leo and Henderson, Wm. Hope.

HICE, RICHARD R.

Discussion of Charles E. Decker's "Preliminary paper on recent crustal movements in the Lake Erie region." Geol. Soc. Am., Bull., vol. 26, no. 1, p. 67, March, 1915.

HILLE, F.

Persistence of ore in depth. Can. Min. Jour., vol. 36, no. 4, pp. 101-102, February 15, 1915.

HILLS, RICHARD C.

1. Coals and coal fields of the Rocky Mountain region. Colliery Engineer, vol. 26, no. 3, pp. 137-141, October, 1915.
2. Coals and coal fields of the Rocky Mountain region. Min. Sc., vol. 72, pp. 22-26, July, pp. 24-28, August, 1915.

HOLLAND, W. J.

A skull of *Bison crassicornis*. Annals of the Carnegie Museum, vol. 9, nos. 3-4, p. 225, 1 pl., March, 1915.

HOLLICK, ARTHUR.

New species of *Ficus* from the interglacial deposits of the Kootenay valley, British Columbia. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, p. 159, March, 1915.

HOLMES, ARTHUR.

Radioactivity and the measurement of geological time. Geologists' Association, Proc., vol. 26, part 5, pp. 289-309, 1 fig., 1915.

HOPKINS, P. E.

1. The Beatty-Munro gold area. Ont. Bur. Mines, Ann. Rept., vol. 24, part 1, pp. 171-184, 9 figs., 1 map, 1915.

2. (Gold discovery in the vicinity of Big Duck lake). Ont. Bur. Mines, Ann. Rept., vol. 24, part 1, pp. 9-13, 5 figs., 1 map, 1915.
3. The Kamiskotia Lake area. See Burrows and Hopkins.
4. The Kowkash gold area. Can. Min. Jour., vol. 36, no. 19, pp. 583-584, 2 figs., October 1, 1915.

HORE, REGINALD E.

1. The Canadian Mining Manual, 1914, 273 pp., illus. Mines Publishing Company, Toronto.
2. Gold deposits of Porcupine district, Ontario. Mich. Acad. Sc., 15th Rept., pp. 54-58, 1913.
3. Ripple marked Huronian quartzite at Nipissing mine, Cobalt, Ontario. Mich. Acad. Sc., 15th Rept., p. 59, 2 pls., 1913.

HOUGHTON, FREDERICK.

The geology of Erie county. Buffalo Soc. Nat. Sc., Bull., vol. 11, no. 1, pp. 1-92, 45 figs., 1914.

HUDSON, GEORGE H.

1. *Ceramograptus Ruedemanni*, a new genus and species of Graptolitoidea, and notes on *Urasterella pulchella*, Billings. Ottawa Naturalist, vol. 28, no. 10, pp. 129-130, 1 pl., Januray, 1915.
2. Some fundamental types of hydrospires with notes on *Porocrinus smithi* Grant. N. Y. State Mus., Bull. 177, pp. 163-165, 2 pls., 1915.

HUGHES, A. D.

Hydraulic mining at Atlin. Min. and Sc. Press, vol. 110, no. 17, pp. 647-654, 7 figs., April 24, 1915.

HUMPHREYS, W. J.

Changes of sea-level due to changes of ocean volume. Wash. Acad. Sc., Jour., vol. 5, no. 12, pp. 445-446, June 19, 1915.

HUNTLEY, L. G.

Oil, gas and water content of Dakota sand in Canada and United States. Am. Inst. Min. Eng., Bull. no. 102. pp. 1333-1353, 6 figs., June, 1915.

HYDE, JESSE E.

1. The Windsor-Pennsylvanian section on the Strait of Canso, Nova Scotia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 264-269, 1914.
2. Windsor and Pennsylvanian formations in Nova Scotia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 107-108, 1915.

INGALL, E. D.

1. Borehole records (water, oil, etc.) Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 331-332, 1914.
2. (Report of the) Water and Boring Division. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 138-143, 1915.

JACOBS, E.

Mineral production of British Columbia. Can. Min. Inst., Bull. 41, pp. 669-673, September, 1915.

JOHNSTON, DOUGLAS W.

The shoreline of Cascumpeque harbor, Prince Edward Island. Abstract: Assoc. Am. Geographers, Annals, vol. 3, p. 112.

JOHNSTON, ROBT. A. A.

1. A list of Canadian mineral occurrences. Canada, Dept. of Mines, Geol. Surv., Memoir 74, 275 pp., 1915.
2. Gay Gulch and Skookum meteorites. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin no. 15, 31 pp., 11 pls., 1 map, 1915.
3. Mineralogy. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 327-330, 1914.
4. Mineralogy. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 134-138, 1915.

JOHNSTON, W. A.

1. The calcareous drift and lacustrine deposits in Rainy River district, Ontario. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 170-177, 1914.
2. Lake Simcoe and Rainy River districts. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, p. 81, 1915.
3. Rainy River district, Ontario. Surficial geology and soils. Canada, Dept. of Mines, Geol. Surv., Memoir 82, 123 pp., 12 pls., 1 fig., 1 map, 1915.

KEELE, J.

1. Clay and shale deposits of the western provinces (Part 5). Canada, Dept. of Mines, Geol. Surv., Memoir 66, 74 pp., 8 pls., 1915.
2. Investigation of the clay resources of Ontario. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, p. 87, 1915.
3. Physical properties of kaolin from the Helen mine. Ont. Bur. Mines, Ann. Rept., vol. 24, part 1, pp. 214-215, 1915.
4. Preliminary report on the clay and shale deposits of the Province of Quebec. Canada, Dept. of Mines, Geol. Surv., Memoir 64, 280 pp., 34 pls., 13 figs., 1 map, 1915.
5. Report on progress of investigation of clay resources. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 288-292, 1914.

KEFFER, FREDERIC.

Notes on the geology and exploration of Copper mountain in the Similkameen district of British Columbia. Can. Min. Inst., Bull. 35, pp. 154-163, 4 pls., 2 figs., March, 1915.

KELSO, J. A.

Portland cement raw materials in Alberta. Mine, Quarry and Derrick, vol. 1, no. 2, pp. 40-41, February 17, 1915.

KEMPER, L. S.

1. Natural hydrocarbons, what they are, and where they are found in North America. *Mine, Quarry and Derrick*, vol. 1, no. 1, pp. 19-22, February 3, 1915.
2. Notes on the geology of that part of southern Alberta embraced in townships 1, 2 and 3, north, range 8, etc. *Mine, Quarry and Derrick*, vol. 1, no. 1, pp. 8-10, February 3, 1915.
3. Some notes on the geology of that part of southern Alberta covered by the Medicine Hat sheet of the maps issued by the Minister of the Interior. *Mine, Quarry and Derrick*, vol. 1, no. 2, p. 51, 1 map. February 17, 1915.

KENDALL, J. D.

The valuation of mines. *Can. Min. Inst., Trans.*, vol. 17, pp. 142-154, 6 figs., 1915.

KEYES, CHARLES.

Lake Superior highlands; their origin and age. *Jour. Geol.*, vol. 23, no. 6, pp. 569-574, 2 figs., September-October, 1915.

KINDLE, E. M.

1. A new bathymetric record for attached algae and diatoms in Lake Ontario. *Jour. of Ecology*, vol. 3, no. 3, pp. 149-152, September, 1915.
2. Limestone solution on the bottom of Lake Ontario. *Am. Jour. Sc.*, vol. 39, 651-656, 3 figs., June, 1915.
3. Note on bottom currents in Lake Ontario. *Am. Jour. Sc.*, vol. 39, pp. 192-196, February, 1915.
4. Notes on the geology and palaeontology of the lower Saskatchewan River valley. Canada, Dept. of Mines, Geol. Surv., Mus. Bull. 21, 25 pp. 4 pls., October 14, 1915.
5. Report of the Invertebrate Palaeontologist. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 300-314, 1914.
6. Report of the Stratigraphical Palaeontologist. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 122-130, 1915.

KINDLE, E. M. and BURLING, L. D.

Structural relations of the Pre-Cambrian and Palaeozoic rocks north of the Ottawa and St. Lawrence valleys. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin no. 18, 23 pp., 2 pls., 6 figs., July 23, 1915.

KLOTZ, OTTO.

Earthquake of February 10, 1914. *Publications of the Dominion Observatory, Ottawa*, vol. 3, no. 1, 14 pp., 1 pl., 1 map, 1915.

KNIGHT, CYRIL W.

1. Metallogenetic epochs in the Pre-Cambrian of Ontario. See Miller and Knight.
2. The north shore of Lake Huron. *Ont. Bur. Mines, Ann. Rept.*, vol. 24, part 1, pp. 216-241, 14 figs., 1915.
3. Records of wells drilled for oil and gas in Ontario. *Ont. Bur. of Mines, Ann. Rept.*, vol. 24, part 2, 96 pp. illus., 1915.
4. Revision of Pre-Cambrian classification in Ontario. See Miller and Knight.

LAKES, ARTHUR.

1. The great china clay deposits of Cornwall, England. *Can. Min. Jour.*, vol. 36, no. 7, pp. 211-214, 5 figs., April 1, 1915.
2. Mining in lake districts of British Columbia. *Min. and Eng. World*, vol. 42, no. 9, pp. 411-414, 5 figs., February 27, 1915.
3. Notes on mining and prospecting in British Columbia. *Min., Eng., and Electrical Record*, vol. 20, no. 7, pp. 161-163, September, 1915.

LAKES, HAROLD.

Glass mine models in mine work. *Min. and Eng. World*, vol. 43, no. 18, pp. 683-685, 1 fig., October 30, 1915.

LAMBE, LAWRENCE M.

1. Contributions to Canadian palaeontology. *Can. Rec. Sc.*, vol. 9, no. 6, pp. 383-386, 1914.
2. On *Ecoceratops canadensis*, gen. nov., with remarks on other genera of Cretaceous horned dinosaurs. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin no. 12, 49, pp., 11 pls., May 7, 1915.
3. Report of the Vertebrate Palaeontologist. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 293-299, 1914.
4. Report of the Vertebrate Palaeontologist. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 116-121, 1915.

LANE, A. C.

Pre-Cambrian nomenclature. *Science*, new ser., vol. 42, pp. 869-870, December 17, 1917.

LARSON, ANDREW G.

The mineral and other resources of the North Fork of the Kettle river in the Grand Forks mining division. *British Columbia Bureau of Mines Bulletin* no. 3, 1914, 22 pp., illus., 1915; *British Columbia, Minister of Mines, Ann. Rept. for 1914*, pp. 340-356, 1915.

LAUCHLI, E.

Tunnelling and geology. *Can. Engineer*, vol. 29, no. 12, pp. 365-372, 6 figs., September 16, 1915.

LAUREYS, HENRY.

Les métaux précieux du Canada. *Bull. de la Soc. de Géog. de Québec*, vol. 9, pp. 259-276, 323-334, 4 figs., 1915.

LAURISTON, VICTOR.

1. The Oil Springs boom. *Mine, Quarry and Derrick*, vol. 1, no. 4, pp. 128-129, March 17, 1915.
2. Ontario's gas fields. *Mine, Quarry and Derrick*, vol. 1, no. 5, p. 156, March 31, 1915.
3. Ontario oil production declines. *Mine, Quarry and Derrick*, vol. 1, no. 2, pp. 68-69, February 17, 1915.

LAVOIE, G. A.

Some remarks on gas in coal. *Can. Min. Inst., Trans.*, vol. 17, pp. 487-492, 1915.

LEE, WILLIS T.

Reasons for regarding the Morrison an introductory Cretaceous formation. Geol. Soc. Am., Bull., vol. 26, no. 3, pp. 303-314, September, 1915.

LEITH, C. K. and ALLEN, R. C.

Discussion of correlation. Jour. Geol., vol. 23, no. 8, pp. 703-729, 2 figs., November-December, 1915.

LEVERETT, FRANK and TAYLOR, FRANK B.

The pleistocene of Indiana and Michigan and the history of the great lakes. U. S. Geol. Surv., Monograph 53, 529 pp., 32 pls., 15 figs., 1915.

LEWIS, J. VOLNEY.

Discussion of paper by Sidney Powers on "Acadian Triassic." Geol. Soc. Am., Bull., vol. 26, no. 1, p. 94, March, 1914.

LINDEMAN, E.

1. The Atikokan and Matawin iron ranges. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, pp. 24-29, 1915.
2. Iron ore occurrences in Cape Breton. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 31-36, 1914.

LINDGREN, WALDEMAR.

The igneous geology of the Cordilleras and its problems. Problems of American Geology, pp. 234-286, 1 map. Yale University Press, New Haven, 1915.

LIVERMORE, ROBERT.

Draining Kerr lake, Cobalt district, Ont. Can. Min. Inst., Trans. vol. 17, pp. 165-181, 3 pls., 4 figs., 1915.

LOYD, E. RUSSELL and HARES, C. J.

The Cannonball marine member of the Lance formation of North and South Dakota and its bearing on the Lance-Laramie problem. Jour. Geol. vol. 23, no. 6, pp. 523-547, 1 fig., September-October, 1915.

LULL, RICHARD SWAN.

1. The mammals and horned dinosaurs of the Lance formation of Niobrara county, Wyoming. Am. Jour. Sc., ser. 4, vol. 40, pp. 319-348, 4 figs., October, 1915.
2. Sauropoda and Stegosauria of the Morrison of North America compared with those of Europe and eastern Africa. Geol. Soc. Am., Bull., vol. 26, no. 3, pp. 323-334, September, 1915.

LUNT, HORACE F.

Newfoundland's mineral resources. Eng. and Min. Jour., vol. 100, no. 22, p. 890, November 27, 1915.

M.

Love's labor lost.—the origin of natural gas and petroleum. Can. Min. Jour., vol. 36, no. 14, pp. 544-426, July 15, 1915.

McCONNELL, R. G.

1. Britannia mine, Howe sound, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 76-79, 1914.
2. Rainy Hollow mineral area, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 29-33, 1 map, 1914.
3. Recent development at the Hidden Creek mine, Observatory inlet, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 55-57, 1 plan, 1914.
4. Summary report of the Geological Survey, Department of Mines (Canada) for the calendar year 1914. 201 pp., 1 fig., 2 diags., 1 map, 1915.
5. Texada island, B.C. Canada, Dept. of Mines, Geol. Surv., Memoir 58, 112 pp., 8 pls., 1 fig., plans and 5 maps, 1914.

MacDONALD, J. A.

1. Gold in Nova Scotia. Can. Min. Jour., vol. 36, no. 16, p. 504, Aug. 15, 1915.
2. The recent gold discovery at Kowkash, northern Ontario. Can. Min. Jour., vol. 36, no. 20, p. 628, October 15, 1915.
3. Silver and gold mining in Ontario. Min. Jour., vol. 108, p. 209, March 27, 1915.

McDONALD, P. B.

1. A trip through eastern Canada. Min. and Sc. Press, vol. 111, no. 21, pp. 775-777, 1 fig., November 20, 1915.
2. Newfoundland. Can. Min. Jour., vol. 36, no. 11, p. 334, June 1, 1915.
3. Newfoundland's iron mines. Can. Min. Jour., vol. 36, no. 18, pp. 554-555, September 15, 1915.
4. Newfoundland's mineral resources. Eng. and Min. Jour., vol. 100, no. 17, pp. 674-675, 1 fig., October 23, 1915.

McGRATH, J. W.

1. Gold deposits of Newfoundland and Labrador. Can. Min. Jour., vol. 36, no. 18, pp. 568-569, September, 15, 1915.
2. Mining in Newfoundland. Can. Min. Jour., vol. 36, no. 15, p. 466, August 1, 1915.

McINTOSH, D. S.

1. Notes on an abnormal wave occurrence on the northern Cape Breton coast. Nova Scotian Inst. Sc., Proc. and Trans., vol. 14, part 1, pp. 41-46, 1 fig., 1915.
2. Notes on a granite contact zone near Halifax, N.S. Nova Scotian Inst. Sc., Proc. and Trans., vol. 13, part 3, pp. 244-249, 1 pl., 1 fig., 1915.

MACKENZIE, J. D.

1. Flathead special map-areas, British Columbia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 41-42, 1915.
2. Graham island, British Columbia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 33-37, 1915.
3. The primary analcite of the Crowsnest volcanics. Am. Jour. Sc., 4th ser., vol. 39, pp. 571-574, May, 1915.
4. South-central Graham island, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 34-54, 1914.

MCLEAN, A.

Pembina mountain, Manitoba. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 69-71, 1915.

MACLEAN, A. and WALLACE, R. C.

Gypsum and salt in Manitoba. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 165-169, 1914.

MACLEAN, T. A.

Lode mining in Yukon. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 37-40, 1914.

MCLEARN, F. H.

1. The Cretaceous sections on the Crowsnest river west of the Blairmore sheet, Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 62-63, 1915.
2. The Lower Ordovician (*Tetragraptus* zone) at St. John, New Brunswick, and the new genus *Protistograptus*. Am. Jour. Sc., 4th ser., vol. 40. pp. 49-59, 2 figs., July, 1915.
3. Notes on the cores of Winnipeg wells, Manitoba. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, p. 72, 1915.

MCLEISH, JOHN.

1. Annual report on the mineral production of Canada during the calendar year 1913. Canada, Dept. of Mines, Mines Branch, (Publication) no. 320, 363 pp., 4 diagrams, 1914.
2. A general summary of the mineral production of Canada during the calendar year 1913. Canada, Dept. of Mines, Mines Branch, (Publication) 319, 50 pp., 1914.
3. Preliminary report on the mineral production of Canada during the calendar year 1913. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913. pp. 159-177, 1914.
4. Preliminary report on the mineral production of Canada during the calendar year 1914. Canada, Dept. of Mines, Mines Branch, (Publication), no. 333, 24 pp., 1915; Summary Report, 1914, pp. 195-213, 1915.
5. The production of cement, lime, clay products, stone, and other structural materials in Canada during the calendar year 1913. Canada, Dept. of Mines, Mines Branch, (Publication) 318, 62 pp., 1914.
6. The production of iron and steel in Canada during the calendar year 1913. Canada, Dept. of Mines, Mines Branch, (Publication) 315, 44 pp., 1914.
7. The production of iron and steel in Canada during the calendar year 1914. Canada, Dept. of Mines, Mines Branch, (Publication) 349, 35 pp., 1915.
8. Report of the Mineral Resources and Statistics division. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 139-142, 1914.
9. Report of the Division of Mineral Resources and Statistics. Canada, Dept. of Mines, Mines Branch, Summary Report, 1914, pp. 163-165, 1915.

MCMILLAN, J. G.

Mines of Ontario. See Sutherland, Collins, McMillan and Bartlett.

MACAULAY, D. A.

The Drumheller coalfield, Alberta. Can. Min. Inst., Bull. 41, pp. 718-730, 8 figs., September, 1915.

MAILHIOT, A.

1. Granites of the Eastern Townships of Quebec. Canada, Dept. of Mines, Geol. Surv., 1913, pp. 217-218, 1914.
2. Granites of the Eastern Townships, Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, p. 100, 1915.

MALCOLM, WYATT.

1. Bibliography of Canadian Geology for 1912. Royal Soc. Can., Trans., ser. 3, vol. 8, sec. 4, pp. 287-315; March, 1915.
2. Bibliography of Canadian Geology for 1913. Roy. Soc. Can., Trans., ser. 3, vol. 8, sec. 4, pp. 317-350, March, 1915.
3. Geology in relation to agriculture in Canada. Canada, Dept. of Trade and Commerce, The Canada Year Book, 1914, pp. 34-38, 3 pls., 1915.
4. Oil and gas fields of Ontario and Quebec. Canada, Dept. of Mines, Geol. Surv., Memoir 81, 248 pp., 1915.

MARTIN, LAWRENCE.

Glaciers and international boundaries. Abstract: Assoc. Am. Geographers, vol. 4, p. 138.

MATTHEW, W. D.

1. Climate and evolution. N. Y. Acad. Sc., Annals, vol. 24, pp. 171-318, 33 figs., February 18, 1915.
2. The Tertiary sedimentary record and its problem. Problems of American Geology, pp. 377-478, 40 figs. Yale University Press, New Haven, 1915.

MATTHEW, W. D. and BROWN, BARNUM.

Corythosaurus, the new duck-billed dinosaur. Am. Mus. Jour., vol. 15, no. 8, pp. 427-428, December, 1915.

MERCIAI, G.

Excursione mineralogica nel Canada. Soc. Geol. Italiana, Boll., vol. 34, pp. 181-201, 1915.

MICKLE, G. R.

1. Discussion of T. A. Rickard's paper on "Persistence of ore in depth." Inst. of Min. and Metallurgy, Bull. 130, pp. 6-8, July 22, 1915.
2. Persistence of ore in depth. Can. Min. Jour., vol. 36, no. 20, p. 615, October 15, 1915.

MILLER, WILLIAM J.

Discussion of paper by John M. Clarke on "Type of rifted relict mountain, or rift-mountain." Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 90-91, March, 1915.

MILLER WILLET G. and KNIGHT, CYRIL W.

1. Metallogenetic epochs in the Pre-Cambrian of Ontario. Ont. Bur. Mines, Ann. Rept., vol. 24, part 1, pp. 243-248, 1 fig., 1915; Roy. Soc. Can., Trans., 3rd ser., vol. 9, sec. 4, pp. 241-249, 1 fig., December, 1915; Abstract: Min. and Sc. Press, vol. 111, no. 11, pp. 401-404, 1 fig., September 11, 1915; Abstract: Science, new ser., vol. 42, p. 469, October 1, 1915.
2. Revision of Pre-Cambrian classification in Ontario. Jour. of Geol., vol. 23, no. 7, pp. 585-599, 1 fig., October-November, 1915; Can. Min. Jour., vol. 36, no. 9, pp. 265-266, 1 fig., May 1, 1915; Abstract: Geol. Soc. Am. Bull., vol. 26, no. 1, pp. 87-88, March, 1915; Abstract: Science, new ser., vol. 41, p. 509, April 2, 1915.

MINES BRANCH, DEPT. OF MINES, CANADA.

1. Economic minerals and mining industries of Canada, Panama Pacific edition. Mines Branch (Publication) no. 322, 78 pp., 19 pls., 1 map, 1914.
2. The production of coal and coke in Canada during the calendar year 1914. Mines Branch, (Publication) no. 348, 39 pp., 1915.
3. The production of copper, gold, lead, nickel, silver, zinc, and other metals in Canada during the calendar year 1914. Mines Branch, (Publication) no. 350, 75 pp., 1915.

MINING MAGAZINE.

1. The Coppermine river. Min. Mag., vol. 12, no. 1, pp. 16-17, January, 1915.
2. Review of mining. Min. Mag. vol. 12, no. 2, pp. 59-65, February, 1915.

MOODIE, ROY L.

1. The migrations and geographic distribution of the fossil amphibia. Am. Jour. Sc., vol. 40. pp. 186-189, 1 fig., August, 1915.
2. The scaled amphibia of the coal measures. Science, new ser., vol. 41, pp. 463-464, March 26, 1915.

MOOK, CHARLES C.

1. Origin and distribution of the Morrison formation. Geol. Soc. Am., Bull., vol. 26, no. 3, pp. 315-322, 4 figs., September, 1915.
2. Statistical study of variations in *Spirifer mucronatus*. N. Y. Acad. Sc., Annals, vol. 26, pp. 175-214, 8 figs., June 30, 1915; Abstract: N.Y. Acad. Sc., Annals, vol. 24, p. 398, May 14, 1915.

MURRAY.

The iron ores of Lake Superior. See Crowell and Murray.

MURRAY, J. A.

(Report on) Mining. Crown Land Dept. of the province of New Brunswick, Ann. Rept. for year ended 31st Oct., 1914, pp. XIV-XXII, 1915.

NICKLES, JOHN M.

Bibliography of North American Geology for 1914 with subject index. U. S. Geol. Surv., Bull. 617, 167 pp., 1915.

O'CONNOR, CHARLES H.

Mineral deposits north of Sault Ste. Marie, Ont. Can. Min. Jour., vol. 36, no. 10, pp. 297-300, 1 fig., May 15, 1915.

O'NEILL, JOHN J.

Geological reconnaissance of the Arctic coast between Demarcation point and the Mackenzie river; with a section inland up the Firth river, Mackenzie district. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 112-115, 1915.

OSBORN, HENRY FAIRFIELD.

Close of Jurassic and opening of Cretaceous time in North America. Geol. Soc. Am., Bull., vol. 26, no. 3, pp. 295-302, 1 fig., September, 1915.

PARKS, W. A.

1. Building and ornamental stones of Quebec. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 63-64, 1914.
2. Building and ornamental stones of Canada. Canada, Dept. of Mine, Mines Branch, Summary Rept., 1914, pp. 74-75, 1915.
3. Report on the building and ornamental stones of Canada, vol. III, Province of Quebec. Canada, Dept. of Mines, Mines Branch, (Publication) no. 279, 304 pp., 52 pls, 12 figs., 1914.
4. Palaeozoic fossils from a region southwest of Hudson bay. Univ. of Toronto Studies, Geol. Ser. no. 9, 95 pp., 7 pls., 1 fig., 1915. Reprinted from the Transactions of the Royal Canadian Institute, vol. XI.

PARSONS, ARTHUR L.

The productive area of the Michipicoten iron ranges. Ont. Bur. Mines, Ann. Rept., vol. 24, part 1, pp. 185-213, 26 figs, 1915.

PARSONS, C. S.

Investigation of the magnetic iron sands at Natashkwan, Que. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 90-96, 1 fig., 1914.

PIERS, HARRY.

A brief historical account of the Nova Scotian Institute of Science and the events leading up to its formation; with biographical sketches of its deceased presidents and other prominent members. Nova Scotian Inst. Sc., Proc. and Trans., vol. 13, part 3, pp. LIII-CIX, 1915.

PIRSSON, LOUIS V. and SCHUBERT, CHARLES.

A text book of geology, 1051 pp., illus. John Wiley & Sons, Inc., New York.

POWERS, SIDNEY.

1. Acadian Triassic. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, p. 93, March, 1915.
2. The geology of a portion of Shelburne county, south-western Nova Scotia. Nova Scotian Inst. Sc., Proc. and Trans., vol. 13, part 4, pp. 289-307, 5 pls., 3 figs., 1915.

3. Geological history of the Bay of Fundy. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 94-95, March, 1915.
4. The origin of the inclusions in dikes. Jour. Geol., vol. 23, pp. 1-10, 166-182, 3 figs., 1915.

PREST, W. H.

1. A new awakening. Industrial Advocate, vol. 20, no. 10. pp. 3-4, August, 1915.
2. Nova Scotia's gold mining in 1914. Copied from Halifax Herald by Industrial Advocate, vol. 20, no. 3, pp. 5-6, January, 1915.

PROSSER, C. S.

Discussion of A. W. Grabau's paper "North American continent in upper Devonian time." Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 89-90, March, 1915.

PRUVOST, PIERRE.

Les bassins houillers du Canada. Société géologique du Nord, Annales 42, pp. 258-293, 1 pl., 8 figs., 1913.

RANSOME, F. L.

The Tertiary orogeny of the North American Cordillera and its problems. Problems of American Geology, pp. 287-376, 1 map. Yale University Press, New Haven, 1915.

RAYMOND, PERCY E.

1. Revision of the Canadian species of *Agelacrinites*. Ottawa Naturalist, vol. 29, nos. 5 and 6, pp. 53-62, 1 pl., August-September, 1915.
2. The succession of faunas at Levis, Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 219-22, 1914.

REEDS, CHESTER A.

Graphic projection of Pleistocene climatic oscillations. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 106-108, March, 1915; Abstract: Science, new ser., vol. 41, pp. 510-512, April 2, 1915.

REINECKE, LEOPOLD.

1. Ore deposits of the Beaverdell map-area. Canada, Dept. of Mines, Geol. Surv., Memoir 79, 178 pp., 13 pls., 9 figs., 1 map, 1915.
2. Physiography of the Beaverdell map-area and the southern part of the interior plateaus of British Columbia. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin no. 11, 58 pp., 5 pls., 3 figs., 1 map, 1915.
3. Road materials in Ontario. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 88-91, 1915.

RICE, WILLIAM NORTH.

The geology of James Dwight Dana. Problems of American Geology, pp. 1-42, 1 pl. Yale University Press, New Haven, 1915.

RICKARD, T. A.

Author's reply to discussion on "Persistence of ore in depth." Inst. of Min. and Metallurgy, Bull. 130, pp. 1-6, July 22, 1915.

RIES, H.

1. Clay and shale deposits of the western provinces (Part 4). Canada, Dept. of Mines, Geol. Surv., Memoir 65, 83 pp., 8 pls., 18 figs., 1915.
2. Clays of British Columbia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 284-287, 1914.
3. Fire-clay deposits of Canada. Am. Inst. Min. Eng., Trans., vol. 45, pp. 123-136, 3 figs., 1915.

ROBBINS, P. A.

Discussion of paper by T. A. Rickard on "Persistence of ore in depth." Inst. of Min. and Metallurgy, Bull. no. 129, pp. 42-47, June 17, 1915.

ROBERTSON, WILLIAM FLEET.

1. British Columbia, the mineral province of Canada, 43 pp., 8 pls. Victoria, B.C.
2. Portland Canal mining division. British Columbia, Minister of Mines, Ann. Rept. for 1914, pp. 157-161, 1915.
3. Preliminary review and estimate of mineral production (British Columbia), 1914. British Columbia, Bureau of Mines, Bull. no. 1, 1915, 42 pp., 1915.
4. The proposed M. M. S. A. standards. Can. Min. Inst., Bull. 43, pp. 838-842, November, 1915; Min. and Metallurgical Soc. of Am., Bull. 89, pp. 226-229, October 31, 1915.
5. Report of the (British Columbia) Bureau of Mines. British Columbia, Minister of Mines, Annual Report for the year ending 31st December, 1914. 544 pp., plates and maps. Victoria, B. C., 1915.

ROBINSON, A. H. A.

Atikokan iron range. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, pp. 29-34, 1915.

ROBINSON, C. W.

An investigation of radio-active minerals in eastern Canada. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 109-112, 1915.

ROGERS, W. R.

List of publications (of Ontario Bureau of Mines) including reports, maps and bulletins (revised to August 1, 1915). Dept. of Lands, Forests and Mines, Bulletin no. 25 of the Ontario Bureau of Mines, 24 pp., 1 map, 1915.

ROSE, BRUCE.

1. Reconnaissance along the Red Deer, James, Clearwater and North Saskatchewan rivers, Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 52-53, 1915.
2. Willowbunch coal area, Saskatchewan. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 153-164, 1 map, 1914.
3. Wood Mountain coal area, Saskatchewan. Canada, Dept. of Mines, Geol. Surv., Summary Rept. 1914, pp. 64-67, 1 map, 1915.

ROWE, J. P.

Probable oil and gas in Montana. Eng. and Min. Jour., vol. 99, pp. 647-649, 1 fig., April 10, 1915.

SAUNDERS, D.

Silver discovery in the Yukon. Min. and Sc. Press, vol. 111, no. 4, p. 121, July 24, 1915.

SCHOFIELD, STUART J.

1. Ainsworth mining camp, British Columbia. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 38-41, 1 fig., 1915.
2. Geology of Cranbrook map-area, British Columbia. Canada, Dept. of Mines, Geol. Surv., Memoir 76, 245 pp., 33 pls., 15 figs., 1 map, 1915.
3. Reconnaissance in East Kootenay, B.C. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 130-138, 1 fig., 1914.

SCHUCHERT, CHAS.

1. The basal Silurian formations of eastern North America. Nat. Acad. Sc., Proc. vol. 1, no. 6, pp. 359-360, June, 1915.
2. Climates of geologic time. Smithsonian Inst. Ann. Rept., 1914, pp. 277-311, 4 figs., 1915.
3. Revision of Palaeozoic *Stellerioidea* with special reference to North American *Asterioidea*. U. S. Nat. Mus., Bull. 88, 311 pp., 38 pls., 41 figs., 1915.
4. A text book of geology. See Pirsson and Schuchert.

SCOTT, G. S.

The search for platinum. Min. and Sc. Press, vol. 111, no. 8, pp. 270-272, August 21, 1915.

SHARP, ALEXANDER.

The story of Rossland mining district. Min., Eng., and Electrical Record, vol. 20, pp. 37-41, 52-60, 18 figs., 1915.

SHAW, E. W.

Discussion of a paper by L. G. Huntley on "Oil, gas, and water contents of Dakota sands in Canada and United States." Am. Inst. Min. Eng., Bull. no. 108, pp. 2428-2430, December, 1915.

SHUTT, FRANK T.

Potash in agriculture. Canada, Dept. of Agriculture, Experimental Farms, Circular no. 7, 8 pp., 1914.

SINNOTT, EDMUND W. and BAILEY, IRVING W.

The evolution of herbaceous plants and its bearing on certain problems of geology and climatology. Jour. Geol., vol. 23, no. 4, pp. 289-306, May-June, 1915.

SLIPPER, S. E.

1. Calgary gas and oil field. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 143-145, 1915.
2. The Sheep River map-area, Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 53-54, 1915.

SMITH, FRANK B.

(Report of the) Coal Mines Branch. Sask., Dept. of Public Works, Ann. Rept. for the financial year 1914-15 ended April 30, 1915, pp. 12-14, 1915.

SMITH, W. H.

1. Canadian mineral occurrences in relation to manufacturing. Min. Jour., vol. 108, pp. 43-45, 65-66, 89-90, 115-117, 1915.
2. Canadian molybdenite deposits. Eng. and Min. Jour., vol. 99, no. 6, pp. 271-272, February 6, 1915.

SPEARMAN, CHARLES.

1. The Kowkash district, Ontario. Can. Min. Jour., vol. 36, no. 19, pp. 585-588, 5 figs., October, 1915.
2. Rocks and ore deposits at Sese kinaka, Ontario. Can. Min. Jour., vol. 36, no. 3, pp. 69-73, 11 figs., February 1, 1915.

SPENCER, J. W.

1. Discussion of paper by J. Barrell on "Factors in strand line movement and their results during Pleistocene and post-Pleistocene." Wash. Acad. Sc., Jour. vol. 5, no. 12, pp. 446-447, June 19, 1915.
2. Results of recent soundings at Niagara and their interpretation. Abstract: Wash. Acad. Sc., Jour., vol. 5, no. 11, pp. 406-407, June 4, 1915.

SPRINGER, J. F.

Sydney, Cape Breton, coal field. Colliery Engineer, vol. 35, no. 11, pp. 581-585, 3 figs., June, 1915.

STANSFIELD, JOHN.

1. The drift on the island of Montreal. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 208-210, 1914.
2. The pleistocene and recent deposits of the island of Montreal. Canada, Dept. of Mines, Geol. Surv., Memoir 73, 80 pp., 2 pls., 10 figs., 2 maps. 1915.

STANTON, T. W.

Invertebrate fauna of the Morrison formation. Geol. Soc. Am., Bull., vol. 26, no. 3, pp. 343-348, September, 1915.

STARRETT, HENRY P.

Canadian nickel production. Eng. and Min. Jour., vol. 100, no. 8, p. 300, August 21, 1915.

STAUFFER, CLINTON R.

The Devonian of southwestern Ontario. Canada, Dept. of Mines, Geol. Surv., Memoir 34, 341 pp., 20 pls., 1 map, 1915.

STEBINGER, EUGENE.

The Montana group of northwestern Montana. U. S. Geol. Surv., Prof. Paper 90, pp. 61-68, 1 fig., October 14, 1914.

STEFANSSON, V.

Prehistoric and present commerce among the Arctic Eskimo. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin no. 6, 29 pp., 1 map, December 30, 1914.

STEIDTMANN, EDWARD.

Summaries of Pre-Cambrian literature of North America for 1909, 1910, 1911 and part of 1912. Jour. Geol. vol. 23, pp. 81-91, 183-188, 261-271, 461-476, 575-584.

STERNBERG, CHARLES H.

1. Evidence proving that the Belly River beds of Alberta are equivalent to the Judith River beds of Dog creek and Cow island, Montana. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, p. 49, March, 1915.
2. Evidence proving that the Belly River beds of Alberta are equivalent with the Judith River beds of Montana. Science, new ser., vol. 42, pp. 131-133, July 23, 1915.

STEWART, J. S.

The Foothills area, west of the Porcupine hills, Alberta. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 54-55, 1915.

STIRLING, J. T.

1. Alberta coal production. Can. Min. Inst., Bull. 36, p. 207, April, 1915.
2. (Report of) the Mines Branch, Dept. of Public Works of the province of Alberta, Ann. Rept., 1914, pp. 67-202, 1915.

SUTHERLAND, T. F.; COLLINS, E. A.; McMILLAN, J. G.; and BARTLETT, JAMES.

Mines of Ontario. Ont. Bur. Mines, Ann. Rept., vol. 24, part 1, pp. 94-170, 20 figs., 1915.

SWINNERTON, H. H.

Suggestions for a revised classification of trilobites. Geol. Mag., decade 6, vol. 2, pp. 487-496, 538-545, 3 figs., November and December, 1915.

TANTON, T. L.

The Harricaw basin north of the Grand Trunk Pacific railway, Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 96-98, 1915.

TAYLOR, F. B.

1. Discussion of a paper by John L. Rich on "Some peculiarities of glacial erosion near the margin of the continental glacier in central Illinois." Geol. Soc. Am., Bull., vol. 26, no. 1, p. 73, March, 1915.
2. Discussion of Charles E. Decker's "Preliminary paper on recent crustal movements in the Lake Erie region." Geol. Soc. Am., Bull., vol. 26, no. 1, p. 67, March, 1915.
3. Old shorelines of Mackinac island and their relations to the lake history. Abstract: Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 68-70, March, 1915.
4. The pleistocene of Indiana and Michigan and the history of the great lakes. See Leverett and Taylor.

TELKER, MINNA J.

The Cascade mountains. Jour. Geol., vol. 13, no. 8, pp. 242-250, April, 1915.

TORY, H. M.

A physical test on a natural (methane) gas well. See Boyle and Tory.

TURNER, H. W.

Association of alunite and pyrophyllite. *Econ. Geol.*, vol. 10, no. 4, pp. 393-394, June 1915.

TYRRELL, J. B.

1. Discussion of the paper by Charles E. Weaver on "The possible occurrence of oil and gas fields in Washington." *Am. Inst. Min. Eng., Bull.* no. 108, pp. 2432-2433, December, 1915.
2. Discussion of paper by Rickard on "Persistence of ore in depth." *Inst. Min. and Metallurgy, Bull.* no. 125, pp. 35-39, February 11, 1915.
3. Gold-bearing gravels of Beauce county, Quebec. *Am. Inst. Min. Eng., Bull.* 99, pp. 609-620, 1 fig., March, 1915.
4. Gold on the North Saskatchewan river. *Can. Min. Inst., Bull.* 34, pp. 68-81, February, 1915; *Mine, Quarry and Derrick*, vol. 1, no. 1, pp. 4-7, February 3, 1915.
5. Pre-Cambrian goldfields of central Canada. *Roy. Soc. Can., Trans.*, ser. 3, vol. 9, sec. 4, pp. 89-118, 2 pls., 1 fig., September, 1915; Abstract: *Econ. Geol.* vol. 10, no. 5, pp. 475-477, July-August, 1915; Abstract: *Science*, new ser., vol. 42, p. 469, October 1, 1915.

UPHAM, WARREN.

Revision of the map of Lake Agassiz. *Jour. Geol.*, vol. 23, no. 8, pp. 780-784, November-December, 1915.

VANDERHOOF, HERBERT.

Development of the Canadian iron and steel industry. *Min. and Eng. World*, vol. 43, no. 26, pp. 1009-1011, 3 figs., December 25, 1915.

VICKERY, BRADFORD.

Notes on the analysis of "ironstone." *Nova Scotian Inst., Sc., Proc. and Trans.*, vol. 13, part 3, pp. 209-215, 1915.

VICTORIN, M.

La flore du Témiscouata, Géologie. *Naturaliste Canadien*, vol. 41, pp. 115-119, 132-138, 4 figs., 1915.

VON ANREP, A.

1. Investigation of the peat bogs and peat industry of Canada 1911-12. Canada, Dept. of Mines, Mines Branch, Bulletin no. 9, 47 pp., 29 pls., 6 figs., 11 maps, 1914.
2. Investigation of peat bogs. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 135-137, 1914.
3. Investigation of peat bogs, 1914. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, pp. 147-149, 1915.

WAIT, F. G.

(Report of the) Division of Chemistry. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, pp. 155-161, 1915.

WALCOTT, CHARLES D.

1. The Cambrian and its problems in the Cordilleran region. Problems of American Geology, pp. 162-233, 2 pls., 8 figs. Yale University Press, New Haven, 1915.
2. Pre-Palæozoic algal deposits. Abstract: Science new ser., vol. 41, p. 879, June 11, 1915; Abstract: Wash. Acad. Sc. Jour., vol. 5, no. 20, p. 649, December 4, 1915.

WALKER, T. L.

1. Certain mineral occurrences in the Worthington mine, Sudbury, Ontario, and their significance. Econ. Geol., vol. 10, no. 6, pp. 536-542, 5 figs., September-October, 1915.
2. Minerals from Baffin land. Ottawa Naturalist, vol. 29, nos. 5 and 6, pp. 63-66, August-September, 1915.

WALLACE, R. C.

1. Gypsum and brines in Manitoba. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 73-80, 1915.
2. Gypsum and salt in Manitoba. See MacLean and Wallace.

WATSON, THOMAS L.

The rutile deposits of the eastern United States. U. S. Geol. Surv., Bull. 580, pp. 385-412, 5 figs., 1914.

WHEELER, ARTHUR O.

1. Motion of the Yoho glacier. Can. Alpine Jour., vol. 6, pp. 133-138, 1 pl., 1915.
2. Robson glacier. Can. Alpine Jour., vol. 6, pp. 139-142, 1 pl., 1915.

WHITBECK, R. H.

The St. Lawrence river and its part in the making of Canada. Am. Geog. Soc., Bull., vol. 47, no. 8, pp. 584-593, August, 1915.

WHITE, I. C.

Discussion of Charles E. Decker's "Preliminary paper on recent crustal movements in the Lake Erie region." Geol. Soc. Am., Bull., vol. 26, no. 1, pp. 66-67, March, 1915.

WHITMAN, ALFRED R.

Structural features of the Porcupine ore deposits. Can. Min. Jour., vol. 36, no. 19, pp. 589-596, 14 figs., October 1, 1915.

WIGGLESWORTH, EDWARD.

The serpentines of Vermont. Boston Soc. Nat. Hist., Proc., vol. 35, no. 3, pp. 95-107, pl. 9, 1 fig., July, 1915.

WILLIAMS, M. Y.

1. Arisaig-Antigonish district, Nova Scotia. Canada, Dept. of Mines, Geol. Surv., Memoir 60, 173 pp., 2 maps, 1914.
2. An *Eurypterid* horizon in the Niagara formation of Ontario. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin, no. 20, 21 pp., 5 pls., October 8, 1915.

3. The middle and upper Silurian of the southwestern Ontario. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 82-86, 1915.
4. The Ordovician rocks of Lake Timaskaming. Canada, Dept. of Mines, Geol. Surv., Museum Bulletin no. 17, 9 pp., 1 pl., 1 fig., June 7, 1915.
5. Stratigraphy of the Niagara escarpment of southwestern Ontario. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 178-188, 2 figs., 1914.

WILSON, ALFRED W. G.

1. Examination of certain copper deposits in Quebec, other metal mines, and office work. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1914, p. 23, 1915.
2. Investigation of the alleged platinum discoveries in the vicinity of Nelson, B.C. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 26-27, 1914.
3. Progress report on the monograph on copper mines and copper mining in Canada. Canada, Dept. of Mines, Mines Branch, Summary Rept., 1913, pp. 25-26, 1914.
4. Zinc reduction in Canada. Min. Jour., vol. 111, pp. 733-774, November 6, 1915.

WILSON, ALICE E.

A new Ordovician *Pelecypod* from the Ottawa district. Ottawa Naturalist vol. 29, no. 8, pp. 85-86, 1 pl., November, 1915.

WILSON, M. E.

1. Northern portion of Buckingham map-area, Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, p. 94, 1915.
2. Southeastern portion of Buckingham map-area, Quebec. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 196-207, 1914.

WILSON, RIDGEWAY R.

Folded and faulted zones in the Crowsnest pass district and their operative effect upon economic mining. Can. Min. Inst., Trans., vol. 17, pp. 466-470, 4 figs., 1915.

WILSON, W. J.

1. Palaeobotany. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 322-326, 1914.
2. Palaeobotany. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 130-134, 1915.

WITHERS, THOMAS H.

Some Palaeozoic fossils referred to the *Cirripedia*. Geol. Mag., decade 6, vol. 2, no. 2, pp. 112-123, 7 figs., March, 1915.

WOODBIDGE, DWIGHT E.

Newfoundland's mineral resources. Eng. and Min. Jour., vol. 100, no. 19, p. 766, November 6, 1915.

WORCESTER, W. C.

- The ceramic resources of Alberta. Mine, Quarry and Derrick, vol. 1, no. 1, pp. 11-13, February 3, 1915.

WRIGHT, W. J.

1. Geology of Clyburn valley, Cape Breton. Canada, Dept. of Mines, Geol. Surv., Summary Rept. 1913, pp. 270-283, 1 map, sections and plans, 1914.
2. Geology of the Moncton map-area, New Brunswick. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1913, pp. 223-227, 1 fig., 1914.
3. Moncton map-area, New Brunswick. Canada, Dept. of Mines, Geol. Surv., Summary Rept., 1914, pp. 101-102, 1915.

Bibliography of Canadian Entomology for the Year 1915.

By PROF. C. J. S. BETHUNE, D.C.L., F.R.S.C.

(Read by title, May Meeting, 1916.)

SUBJECT INDEX.

Acarina: 25, 87.

Arachnida: 50, 104.

Beneficial Insects: 41, 94, 120, 130.

Beneficial Mammals and Birds: 147, 150.

Bird Protection: 81.

Coleoptera: 11, 26, 37, 51, 56, 89, 102, 131, 140, 143, 144, 156, 163.

Diptera: 1, 2, 3, 4, 5, 45, 77, 90, 102, 111, 112, 136, 149, 155, 174.

Economic Entomology:—

Army-worm: 8, 59, 64.

Bacterial Diseases: 48, 49.

Field-Crop Insects: 40, 63, 68, 69, 71, 80, 86.

Forest and Shade-tree Insects: 30, 80, 86, 101, 141, 142, 143, 153.

Fruit-tree Insects: 20, 21, 22, 25, 42, 57, 80, 82, 86, 93, 95, 103, 105, 106, 139.

General: 23, 42, 46, 57, 80, 86.

Greenhouse Insects: 80, 86, 170.

Household Insects: 76, 77, 79, 80, 101.

Insecticides: 42, 57, 60, 67, 68, 114, 129, 138.

Insects of the Year: 24, 36, 58, 73, 97, 99, 109, 118, 126, 128, 151.

Lice affecting Poultry: 7.

Locusts: 60, 63, 67, 71, 172.

Vegetable Insects: 68, 69, 70, 72, 80, 86.

Wax-moth Larvae: 6.

Ephemera: 31, 32.

Gall Insects: 15, 35, 36, 52.

General Entomology: 14, 33, 39, 44, 53, 62, 83, 100, 117, 164, 165, 167.

Hemiptera-Heteroptera: 115, 116, 152.

Hemiptera-Homoptera: 27, 28, 30, 93, 110, 154, 171.

Historical: 78, 84, 85, 98, 108, 166, 168.

Hymenoptera: 5, 10, 15, 43, 47, 55, 107, 124, 125, 134, 135, 137, 169.

Lepidoptera: 5, 16, 17, 18, 19, 29, 34, 61, 65, 66, 68, 75, 88, 102, 119, 120, 130, 132, 133, 145, 146, 173, 175.

Mimicry: 148.

Neuropteroid Insects: 9.

Obituary Notices: 12, 13.

Odonata: 54, 91, 113, 158, 160, 161, 162.

Orthoptera: 38, 63, 74, 102, 121, 122, 123, 157, 159.

Parasites: 47, 80, 86, 90, 127.

Trichoptera: 92, 96.

1. *Aldrich, J. M.*
The Dipterous genus *Symphoromyia* in North America. Proc. U. S. National Museum, vol. 49, pp. 113-142, eleven figures, July, 1915. (A key and descriptions of seventeen species are given, six of which, including two new species, are from the North-west Provinces of Canada and British Columbia).
2. *Alexander, C. P.*
A new nearctic *Gonomyia* (Tipulidae, Diptera). Entomological News, vol. 26, pp. 170-172, three figures, April, 1915. (A new species of Crane-fly from Nova Scotia, *G. Mathesoni*, is described and figures given of wing venation and genitalia).
3. *Alexander, C. P.*
New or little-known Crane-flies from the United States and Canada. Tipulidae, Diptera. Prof. Acad. Nat. Sci., Philadelphia, vol. 66, Part 3, pp. 579-606, three plates, 1915. (Includes two new Canadian species: *Limnophila hortensia* from British Columbia, and *Phalacrocerca noxena* from Nepigon, Ont.).
4. *Alexander, C. P.*
New or little-known Crane-flies from the United States and Canada—Tipulidae, Diptera. Part 2, Proc. Acad. Nat. Sci., Philadelphia, vol. 67, Part 3, pp. 458-514, six plates, Sept., 1915. (Among the new species described are nine from north-eastern Canada).
5. *Anderson, E. M.*
Insects recorded in the Atlin District (Northern British Columbia) during the summer of 1914. Proc. B.C. Ent. Soc., No. 6, n.s., pp. 122-132. (An annotated list of Butterflies, Moths and Diptera taken in this arctic region. Also a list of Lepidoptera and Hymenoptera collected in the Okanagan District in 1913 and not previously recorded).
6. *Atkins, E. W.*
Destruction of comb by the Wax Moth larvae. Can. Horticulturist and Beekeeper, vol. 23, No. 9, p. 216, September, 1915.
7. *Baker, A. W.*
Lice affecting Domestic Fowl. Canadian Entomologist, vol. 47, pp. 237-241, plate, August, 1915.
8. *Baker, A. W.*
The Army-worm in Ontario in 1914. 45th Annual Report, Entomological Society of Ontario, pp. 75-87, 1914.
9. *Banks, Nathan.*
New Neuropteroid Insects, native and exotic. Proc. Acad. Nat. Sci., Philadelphia, Vol. 66, Part 3, pp. 608-632, one plate, 1915. (Includes one new Canadian species: *Callibactis semicostata* from Stony Mountain, Manitoba).

10. *Banks, Nathan.*
New Fossorial Hymenoptera. Can. Ent., vol. 47, pp. 400-406, December, 1915. (Twelve new species of fossorial wasps are described; one, *Aganiella cupidella*, was taken at Ridgeway, Ont.).
11. *Beaulne, J. I.*
Les Coleopteres du Canada. Le Naturaliste Canadien, vol. 41, pp. 108-111, Janvier; pp. 120-127, Fevrier; pp. 139-143, Mars; pp. 155-160, Avril; pp. 171-175, Mai; pp. 189-192 Juin; vol. 42, pp. 13-15, Juillet; pp. 29-31, Aout; pp. 45-47, Septembre; pp. 59-63, Octobre, 1915. (Gives the bibliography and distribution of the species found in Canada. The list reaches *Oodes* in the Carabidae).
12. *Bethune, C. J. S.*
Henry Herbert Lyman, M.A. 45th Ann. Report, Ent. Soc. Ont. pp. 118-121, portrait, 1914.
13. *Bethune, C. J. S.*
Dr. William Saunders, C.M.G. 45th Ann. Report, Ent. Soc. Ont., pp. 121-123, portrait, 1914.
14. *Bethune, C. J. S.*
Bibliography of Canadian Entomology for the year 1914. Trans. Royal Society of Canada, Third Series, vol. 9, Section iv., pp. 263-278, 1915.
15. *Beutenmuller, W.*
A new Diastrophus on Strawberry. Can. Ent., vol. 47, pp. 353-354, figure, November 1915. (Description of a Hymenopterous fly belonging to the Cynipidae which makes a gall on the stems of strawberry leaves. Taken at Toronto).
16. *Bird, Henry.*
New species and histories in Papaipema, Smith (Lepidoptera). Can. Ent., vol. 47, pp. 109-115, plate, April, 1915. (Continuation of a series of papers on the root-boring larvae and moths of this genus. Two new species are described.
Ibid, pp. 145-151, plate, May, 1915.
(Descriptions of the larval stages and habits of *P. speciosissima* and *furcata*).
17. *Blackmore, E. H.*
Further notes on the species of the genus Hydriomena occurring on Vancouver Island. Proc. British Columbia Ent. Soc., No. 6, n.s., pp. 114-115.
18. *Blackmore, E. H.*
Notes on the changes in Geometrid nomenclature, with records of species new to the list of Geometridae found in British Columbia. Proc. B.C. Ent. Soc., No. 6, pp. 116-121.
19. *Busck, August.*
Descriptions of new North American Microlepidoptera. Proc. Ent. Soc., Washington, vol. 17, pp. 79-94, June, 1915. (Includes two new species from Aweme, Man., *Gnorimoschema gibsonella* and *Coleophora manitoba*, and one, *Incurvaria itoniella*, from Kaslo, B.C.).

20. *Caesar, L. and Spencer, G. J.*
Cherry Fruit-flies. Ontario Agricultural College, Guelph, Bulletin 227, January, 1915, pp. 30, eighteen figures.
21. *Caesar, L.*
Deformed Apples and their Causes. Can. Ent., vol. 47, pp. 49-54, four figures, February, 1915.
22. *Caesar, L.*
Cherry Fruit-flies. 45th Ann. Report, Ent. Soc. Ont., pp. 107-111, two figures, 1914. (The life-histories of two species, *Rhagoletis fausta* and *cingulata*, are described).
23. *Caesar, L.*
Insect friends and foes of Agriculture. Can. Ent., vol. 47, pp. 345-351, November, 1915.
24. *Caesar, L.*
Insects of the season in Ontario. 45th Ann. Report Ent. Soc. Ont., pp. 42-46, six figures.
25. *Caesar, L.*
An imported Red Spider attacking fruit trees. 45th Ann. Report, Ent. Soc. Ont., pp. 102-106, two figures, 1914. (A full account of the mite, *Tetranychus pilosus*, the injuries it inflicts and methods of control).
Ibid., Can. Ent., vol. 47, pp. 57-58, two figures, February, 1915.
26. *Casey, Thos. L.*
Memoirs on the Coleoptera, Part VI, 1915, Lancaster, Pa., 460 pages. (The contents are: 1. A review of the American species of Rutelinae, Dynastinae and Cetoniinae. The species belonging to these sub-families of the Scarabaeidae are for the most part confined to the southern and western States and to sub-tropical regions, but the few found in Canada are fully described; among them is a new species, *Cremastocheilus pocularis* from Aweme, Manitoba (p. 350), and a new subspecies, *Paranomala Canadensis* from Ontario (p. 33). *Strigoderma* (*Melolontha*) *arboricola*, Fabr., is recorded from Canada, *Eurhipidia* (*Euphoria*) *nigripennis*, Klages, from Toronto, *Cremastocheilus armatus*, Walk., from Vancouver, B.C. and *C. knochi*, Lec., from Aweme, Man. New generic names are proposed for several familiar Canadian species.)
2. Studies in some Staphylinid genera of North America. Seven new species are described from Aweme, Manitoba, five from British Columbia, two from Ontario and two from Quebec.)
27. *Chapais, J. C.*
L'Aphrophore ecumeuse—crachat de coucou. Le Naturaliste Canadien, vol. 41, pp. 129-131, Mars. 1915. (A description of the "Spittle-insect," *Aphrophora spumaria*, its life-history and a method of control.)
28. *Chapais, J. C.*
Aphrophora spumaria, Cuckoo-spit. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 34-35, 1914-15.

29. *Chrystal, R. Neil.*
Notes on *Lithocolletis gaultheriella*, Wals.—Leaf-miner in *Gaultheria shallon*
Proc. British Columbia Ent. Soc., No. 6, n.s., pp. 111–113, fig., June, 1915.
30. *Chrystal, R. N.*
Forest Insect conditions in Stanley Park, Vancouver, B.C. 7th Annual
Report, Quebec Soc. Prot. Plants, etc., pp. 72–75, two figures, 1914–1915.
31. *Clemens, Wilbert A.*
Mayflies of the *Siphonurus* group. Can. Ent., vol. 47, pp. 245–260
three plates, August, 1915. (Keys to the genera in both imago and nymph
stages are given, and also to both stages of the species of *Siphonurus*.
Many details of life-histories are related. A new genus, *Siphloplecton*,
founded on specimens from Georgian Bay, Ont., is described).
32. *Clemens, W. A.*
Rearing experiments and ecology of Georgian Bay Ephemeridae. Contri-
butions to Canadian Biology, being studies from the Biological Station
of Canada, 1911–1914, Fasciculus II. Fresh water Fish and Lake Biology
pp. 113–128, two plates and one text figure, Ottawa, 1915.
Life-histories of Georgian Bay Ephemeridae of the genus *Heptagenia*.
Ibid, pp. 131–143, four plates and one text figure. (A key to the male
imagos of the genus, with descriptions of all stages, also figures of nymphs
and structural details).
33. *Cockerell, T. D. A.*
Sunflower Insects. Can. Ent., vol. 47, pp. 280–282, September, 1915.
34. *Cockerell, T. D. A.*
Monograph of the Bombycine Moths of North America, including their
transformations and origin of the larval markings and armature. Part iii,
Families Ceratocampidae, Saturniidae, Hemileucidae and Brahmaeidae:
by Alpheus Spring Packard. Vol. xii, First Memoir, National Academy
of Sciences, Washington, D.C. 516 pages, 4 to., 113 plates, 34 of which,
depicting larvae, are coloured). (This posthumous work of Dr. Packard,
edited by Prof. Cockerell, includes the species of Saturniidae that are found
in Canada.)
35. *Cosens, A.*
Notes on the Strawberry leaf petiole Gall, *Diastrophus fragariae*, Beutm.
Can. Ent., vol. 47, pp. 354–355, figure, November, 1915.
36. *Cosens, A.*
Insects of the year in the Toronto District. 45th Ann. Report, Ent. Soc.
Ont., pp. 16–19, 1914, two figures. (Contains observations on the habits
of *Metzneria lapella*, whose larvae feed on the heads of the Small Burdock;
a list of the Sawfly gall producers found in the district, and other observa-
tions).
37. *Craighead, F. C.*
Contributions toward a classification and biology of the North American
Cerambycidae: Larvae of the Prioninae. Report No. 107, Bureau of
Entomology, U.S. Dept. of Agriculture, Washington, pp. 24, eight plates,
June, 1915. (Several Canadian species are described).

38. *Crampton, G. C.*

The Thoracic Sclerites and the systematic position of *Grylloblatta campodeiformis*, Walker, a remarkable Annectant "Orthopteroid" insect. Ent. News, vol. 26, pp. 337-350, plate, October, 1915. (A study of the external anatomy of this singular insect, which was discovered by Dr. E. M. Walker and described in the Canadian Entomologist, vol. 46, pp. 93-99, March, 1914).

39. *Criddle, Norman.*

Some inhabitants of a Sand Plain in June. Can. Ent., vol. 47, pp. 24-30, January, 1915.

40. *Criddle, Norman.*

The Hessian-fly and the Western Wheat-stem Saw-fly in Manitoba, Saskatchewan and Alberta. Bulletin No. 11, Ent. Branch, Dept. Agric., Ottawa, pp. 23, four figures, 1915.

41. *Crosby, C. R., and Matheson, R.*

An insect enemy of the Four-lined Leaf-bug (*Poecilopsus lineatus*, Fabr.). Can. Ent., vol. 47, pp. 181-183, four figures, June, 1915. (The larvae of a Chalcid fly, *Cirrospilus ovisugosus*, sp. nov., were found devouring the eggs of this injurious bug. The new species is figured and fully described).

42. *Crosby, C. R.*

Some successes and failures in controlling Insects in 1914. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 23-33, three figures, 1914-1915. (Deals with the Fruit-tree Leaf-roller, *Archips argyrospila*, and Apple Red Bugs).

43. *Cushman, R. A.*

Descriptions of new Ichneumonidae and taxonomic notes. Proc. Ent. Soc. Washington, vol. 17, pp. 132-142, September, 1915. (Includes one new species, *Xenoschensis gracilis*, from Banff, Alberta).

44. *Day, G. O.*

Nomenclature and Classification. Proc. British Columbia Ent. Soc., No. 6, n.s., pp. 99-110, June, 1915.

45. *Dietz, W. G.*

Two new Tipulidae from northern Alberta. Can. Ent., vol. 47, pp. 329-332, two figures, October, 1915. (*Limnobia gracilis* and *Dicranomyia aquila* are described and the wing-venation figured).

46. *Duporte, E. M.*

A brief report of some phases of Entomological investigations. Agricultural Gazette of Canada, vol. 2, pp. 569-572, two figures, June, 1915. (Records the discovery of parasites of the Apple Bud-moth; a bacillus destroying Tent caterpillars; a disease of White-grubs; the occurrence of the Wavy-striped Flea-beetle and a Clover-seed Chalcid).

47. *Du Porte, E. M.*
Some insect parasites of the Bud-moth. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 76-77, 1914-1915. (Four species of Hymenoptera are recorded).
48. *Du Porte, E. M.*
Two Bacterial diseases of injurious insect larvae. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 81-85, one figure, 1914-1915.
49. *Eastman, J. W.*
The part played by insects in the spread of plant-diseases. Proc. British Columbia Ent. Soc., No. 7, n.s., pp. 18-21, July, 1915.
50. *Emerton, J. H.*
Canadian Spiders, II. Trans. Connecticut Academy of Arts and Sciences, Vol. 20, pp. 145-160, August, 1915. 3 plates. (Contains descriptions of 14 new species from the western Provinces and notes on the distribution of other forms).
51. *Fall, H. C.*
A revision of the North American species of *Pachybrachys*. Trans. Am. Ent. Soc., Phil., vol. 41, pp. 291-486, Sept., 1915. (A very important monograph of this difficult genus of Chrysomelid Coleoptera. 159 species are recorded and all forms known to occur in Canada are included).
52. *Felt, E. P.*
New Gall Midges. Journal of Economic Entomology, vol. 8, pp. 405-409, August, 1915. (Includes the description of the larva and adult female of a new species from Toronto, *Dasyneura torontoensis*; obtained from a root gall on *Mianthemum canadense*, also the description of the female of *Asteromyia? laeviana*, Felt, found at Toronto on a similar gall on *Aster sagittifolius*).
53. *Fyles, T. W.*
Mountains and Hills. 45th Ann. Report, Ent. Soc. Ont., pp. 91-96, 1914 (Rambles of a nature-lover among the mountains and hills of the Eastern Townships of Quebec, and his observations of living creatures of many sorts).
54. *Fyles, T. W.*
Quebec Dragonflies. Ottawa Naturalist, vol. 29, pp. 66-67, Aug.-Sept., 1915. (A list of thirty-five species taken in the Province of Quebec).
55. *Gahan, A. B.*
A revision of the North American Ichneumon flies of the sub-family *Opiinae*. Proc. U. S. National Museum, vol. 49, pp. 63-95, two plates, No. 2095, August, 1915. (Keys are given to the genera and to the species of *Opius*, the types in the Provancher collection at Quebec are referred to).
56. *Germain, Bro.*
A European beetle recently introduced into Canada. Can. Ent., vol. 47, p. 309, September, 1915. (Records the capture near Ottawa of *Orchestes scutellaris*, a jumping Curculionid).

57. *Getchell, F. H.*
Notes on some insects of the Lower Fraser River Valley. Proc. British Columbia Ent. Soc., No. 7, n.s., pp. 30-32, July, 1915.
58. *Gibson, Arthur.*
Insects of the year in the Ottawa District. 45th Annual Report, Ent. Soc., Ont., pp. 13-15.
59. *Gibson, Arthur.*
The 1914 outbreak of the Army Worm in Canada. 45th Annual Report, Ent. Soc. Ont., pp. 72-75.
60. *Gibson, Arthur.*
Experiments with Poisoned Bran Baits for locust control in eastern Canada. 45th Annual Report, Ent. Soc. Ont., pp. 97-100.
61. *Gibson, Arthur.*
Variation in the colour of the Bristles of the Hedgehog Caterpillar, *Isia isabella*, S. & A. 45th Annual Report Ent. Soc., Ont. p. 117.
62. *Gibson, Arthur.*
The Entomological Record, 1914. 45th Annual Report, Ent. Soc. Ont., pp. 123-150. (The fourteenth annual publication of this record of captures of new and rare insects of the various orders, made throughout the Dominion; references are also given to the important literature which appeared during 1914).
63. *Gibson, Arthur.*
The Control of Locusts in Eastern Canada. Dominion of Canada, Dept. of Agric., Ent. Branch Circular No. 5, pp. 1-8, six original illustrations.
64. *Gibson, Arthur.*
The Army worm, *Cirphus unipuncta*, Haw. Dominion of Canada, Dept. of Agric., Ent. Branch Bulletin No. 9, pp. 1-34, nineteen illustrations, mostly original.
65. *Gibson, Arthur.*
Notes on the Preparatory Stages of *Proserpinus flavofasciata ulalume*. Ottawa Naturalist, vol. xxviii, pp. 143-144. Jan., 1915.
66. *Gibson, Arthur.*
Fauna Ottawaensis—Order Lepidoptera; Family Noctuidae; subfamily Phytometrinae. Ottawa Naturalist, vol. xxviii, pp. 151-155, Feb., 1915. (A list with dates of occurrence of the moths of this subfamily found in the Ottawa district. Larval notes on certain species are included).
67. *Gibson, Arthur.*
The Kansas Remedy for the Control of Locusts. Proc. Ent. Soc. of British Columbia, No. 7, n.s., p. 45, July, 1915.

68. *Gibson, Arthur.*
Cutworms and their Control. Dominion of Canada, Dept. of Agriculture, Ent. Branch Bull. No. 10, pp. 1-31, twenty illustrations, mostly original. (The 15 most destructive Canadian species are described and their habits, and life-histories discussed).
69. *Gibson, Arthur.*
The Control of Cutworms. Agricultural Gazette, vol. 2, No. 4, pp. 330-332, April, 1915, three original illustrations.
70. *Gibson, Arthur.*
Investigations in Vegetable Insects. Agricultural Gazette, vol. 2, No. 7, pp. 637-638, July, 1915.
71. *Gibson, Arthur.*
Locust Control Work in Eastern Canada in 1915. Agricultural Gazette, vol. 2, No. 10, pp. 937-940, October, 1915, two illustrations.
72. *Gibson, Arthur.*
Common Vegetable Crop Insects and their Control. Canadian Horticulturist, vol. xxviii., pp. 271-272, Dec., 1915.
73. *Grant, C. E.*
Insects of the year in the Orillia District. 45th Ann. Report Ent. Soc. Ont., p. 16, 1914. (Records the first appearance of the Asparagus beetles, *Crioceris asparagi*, and *12-punctatus*).
74. *Hebard, Morgan.*
Records of Orthoptera from Newfoundland. Ent. News, vol. 26, p. 306. July, 1915.
75. *Herrick, G. W., and Leiby, R. W.*
The pupal instar of the Fruit-tree Leaf-roller, *Archips argyrospila*. Can. Ent., vol. 47, pp. 185-187, June, 1915.
76. *Herrick, Glen W.*
Insects injurious to the Household and annoying to Man. The Macmillan Company, 470 pages, eight plates, 152 figures, 1914. (A large proportion of the insects described are found in Canada).
77. *Hewitt, C. Gordon.*
Notes on the Pupation of the House-fly, (*Musca domestica*) and its mode of overwintering. Can. Ent., vol. 47, pp. 73-78, one figure, 1915.
78. *Hewitt, C. Gordon.*
Applied Entomology in Canada: Its Rise and Progress. 45th Ann. Rept. Ent. Soc. Ont., 1914, pp. 28-41.
79. *Hewitt, C. Gordon.*
House-fly Control. Agric. Gazette of Canada, vol. 2, No. 5, pp. 418-421, 1915. (This paper is written for the benefit of those desiring to undertake an organized campaign for the suppression of the House-fly.)

80. *Hewitt, C. Gordon.*
Report of the Division of Entomology, 1913-14. Ann. Rept. Exp. Farms, Dept. Agric. Canada, pp. 853-876.
81. *Hewitt, C. Gordon.*
Protection of Birds. Sixth Ann. Report Commission of Conservation, 5 pp., 1915.
82. *Hewitt, C. Gordon.*
Two serious Fruit Pests new to Canada. Agric. Gazette of Canada, vol. 2, No. 8, pp. 732-737, four figures. (The discovery in British Columbia of the Pear Thrips, *Taeniothrips pyri*, and of the Black Currant Gall Mite, *Eriophyes ribis*, is described).
83. *Hewitt, C. Gordon.*
New Entomological Laboratories. Agric. Gazette, vol. 2, No. 12, pp. 1146-1149 (illust.).
84. *Hewitt, C. Gordon.*
Jean Henri Fabre. Can. Ent., vol. 47, pp. 381-383, Dec., 1915.
85. *Hewitt, C. Gordon.*
An Early Reference to the Relation of Insects to Disease. Can. Ent., vol. 47, pp. 396-399. Dec., 1915.
86. *Hewitt, C. Gordon.*
Report of the Dominion Entomologist for the year ending March 31st, 1915. Dept. Agric., Ottawa, 40 pp., four figures, one map.
87. *Hewitt, C. Gordon.*
A contribution to a Knowledge of Canadian Ticks. Trans. Royal Society of Canada, Third Series, vol. 9, Section iv, pp. 225-239, map and three plates, 1915. (A list of the species so far known to occur in Canada.)
88. *Holland, W. J.*
The Butterfly Guide: a pocket manual for the ready identification of the common species found in the United States and Canada. Doubleday, Page & Co., Garden City, New York, pp. 237, 1914. (This convenient Manual is illustrated with 295 coloured figures, representing 255 species and varieties. There are also five plates in explanation of structure, venation, metamorphosis, etc.)
89. *Hopkins, A. D.*
A new genus of Scolytoid Beetles. Journ. Washington Acad. of Sciences, vol. 5, No. 12, pp. 429-433, June, 1915. (The new genus *Conophthorus* includes two new species from Ontario, *C. resinosae* and *monticolae*; another, *C. coniperda*, Schwarz, is described in the synopsis).
90. *Johnson, Charles W.*
Note on the species of the genus *Acrocera*. Psyche, vol. 22, pp. 198-203, four figures, December, 1915. (One species of these Dipterous flies, parasitic on spiders, *A. bimaculata*, Loew, is reported from Levis Co., Quebec).

91. *Kennedy, C. H.*
Notes on the life-history and ecology of the Dragonflies (Odonata) of Washington and Oregon. Proc. U. S. National Museum, vol. 49, pp. 259-345, two hundred and one figures, No. 2107, July, 1915. (One species described and figured, *Macromyia magnifica*, is stated to occur in British Columbia).
92. *Krafka, Joseph.*
A Key to the families of the Trichopterous larvae. Can. Ent., vol. 47, pp. 217-225, two plates, July, 1915.
93. *Leonard, M. D.*
The immature stages of the Black Apple-leaf Hopper, *Idiocerus Provancheri*, Van Duzee. Journal of Economic Entomology, vol. 8, pp. 415-419, plate, August, 1915. (This species has been recorded from Montreal, Hamilton and Winnipeg, as well as from many places in the Northern States.)
94. *Letourneau, F.*
Insectes bienfaiteurs: quelques-uns des plus connus. Le Naturaliste Canadien, vol. 41, pp. 113-115, Fevrier, 1915.
95. *Letourneau, F.*
Un ennemi de l'arboriculteur—La Pyrale de la pomme (*Carpocapsa pomonella*, Linn.). Le Naturaliste Canadien, vol. 41, pp. 145-147, Avril, 1915.
96. *Lloyd, J. T.*
Notes on *Ithytrichia confusa*, Morton. Can. Ent., vol. 47, pp. 117-121, plate, April, 1915. (Trichoptera)
97. *Lochhead, W.*
Brief notes on some of the injurious insects of Quebec in 1914. 45th Ann. Report Ent. Soc. Ont., pp. 59-61.
98. *Lochhead, W.*
Jean Henri Fabre, the French Entomologist. 45th Ann. Report Ent. Soc. Ont., pp. 61-68, portrait, 1914.
99. *Lochhead, W.*
Principal injurious insects of the season, 1914. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 121-125, one figure, 1914-1915.
100. *Lochhead, W.*
The Web of Life. Presidential Address. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 16-22, 1914-1915. (A discussion of the inter-relations that exist throughout Nature and the effect of disturbances in any one part upon others).
101. *Lochhead, W.*
Insects affecting shade-trees, green house plants, domestic animals and the household. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 126-134, 1914-1915.

102. *Lockhead, W.*
Useful Keys to some economic families of insects. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 135-142, 1914-1915. (The families dealt with are the Sphingidae, Tabanidae and Trypetidae, Cerambycidae, Curculionidae and Scolytidae, and four of the order Orthoptera).
103. *Lockhead, W.*
Insects of the Orchard. Annual Report of the Pomological Society of Quebec, pp. 57-61, 1914.
104. *Lovell, John H.*
Insects captured by the Thomisidae. Can. Ent., vol. 47, pp. 115-116, plate, April, 1915.
105. *Lyne, W. H.*
The control of incipient infestation of Codling-moth in a new district. Proc. British Columbia Ent. Soc., No. 7, n.s., pp. 11-13, July, 1915.
106. *Lyne, W. H.*
Comments on some peculiarities in connection with the life-history of the Codling-moth on the Pacific Coast. Proc. British Columbia Ent. Soc., No. 7, n.s., pp. 33-35, July, 1915.
107. *Merrill, J. H.*
On some genera of the Pimpline Ichneumonidae. Trans. Am. Ent. Soc., Phil., vol. 41, pp. 109-154, three plates, June, 1915. (Includes descriptions of several Canadian forms and a new species, *Pseudorhyssa sternata*, taken at Toronto.)
108. *Morris, F. J. A.*
The Centenary of Kirby and Spence. Can. Ent., vol. 47, pp. 384-386, December, 1915.
109. *Morris, F. J. A.*
Insects of the year in the Port Hope District. 45th Ann. Report Ent., Soc. Ont., pp. 20-22, 1914.
110. *Muir, F.*
A contribution towards the Taxonomy of the Delphacidae. Can. Ent., vol. 47, pp. 208-212, July, 1915; 261-270, August; 296-302, September; 317-320, October.
111. *Osburn, Raymond C.*
Notes on species of *Eristalis* (Diptera, Syrphidae). Journal New York Ent. Soc., vol. 23, p. 83, March 1915. (Mentions that the European *E. arbustorum* is found from Ohio to Labrador, and that *E. rupium*, Fabr., has been taken at Atlin, B.C., its first discovery in North America).
112. *Osburn, Raymond C.*
Studies in Syrphidae—iv. Species of *Eristalis* new to America, with notes on others. Journal New York Ent. Soc., vol. 23, pp. 139-145, June, 1915. (Reports the occurrence in many localities, including Ottawa, St. John, N.B., and Newfoundland of *E. arbustorum*, Linn.; *E. rupium*, Fabr., in British Columbia; *E. nemorum*, B.C., and Montreal).

113. *Osburn, Raymond C.*
A small collection of Odonata from Atlin, British Columbia. *Journal New York Ent. Soc.*, vol. 23, pp. 152-153, June, 1915.
114. *Palmer, L. L.*
Sprays of up-to-date interest. *Proc. British Columbia Ent. Soc.*, No. 7, n.s., pp. 14-16, July, 1915.
115. *Parshley, H. M.*
Systematic papers on New England Hemiptera. I. Synopsis of the Families. *Psyche*, vol. 22, pp. 88-94, two, plates, June, 1915. (The descriptive synopsis of the families of the Heteroptera, with figures of characteristic details, includes those found in eastern Canada).
116. *Parshley, H. M.*
Systematic papers on New England Hemiptera. II. Synopsis of the Pentatomidae. *Psyche*, vol. 22, pp. 170-177, plate, October, 1915. (Includes a large number of Canadian species).
117. *Patterson, John.*
Canadian Institute: General Index to publications, 1852-1912. University Press, Toronto, 1914, p. 518. (This elaborate Index contains references to entomological papers published many years ago by Hincks, Couper, Saunders, Bethune, Geddes, Brodie and others).
118. *Petch, C. E.*
Insects injurious in southern Quebec in 1914. 45th Ann. Report, Ent. Soc. Ont., pp. 70-71, 1914.
119. *Perrin, Joseph.*
Additions to the catalogue of Butterflies and Moths collected in the neighborhood of Halifax, etc., Nova Scotia. *Trans. Nova Scotian Institute of Science*, vol. 14, Part I, pp. 49-56, October, 1915.
120. *Poole, Henry S.*
Senecio jacobaea and *Callimorpha jacobaea* (The Cattle-killing Ragwort and the Cinnabar Moth). *Trans. Nova Scotian Inst. of Science*, vol. 13, Part 4, pp. 279-288, July, 1915. (An account of the introduction and spread of the weed, locally known as "Stinking Willie" in Nova Scotia and a discussion of the advisability of introducing the moth in order that its larvae might control the growth and spread of the weed, which causes a serious cattle disease).
121. *Rehn, J. A. G., and Hebard, M.*
Studies in American Tettigoniidae (Orthoptera). IV. A synopsis of the species of the genus *Orchelimum*. *Trans. Am. Ent. Soc., Phil.*, vol. 41, pp. 11-83, four plates, March, 1915. (Contains a key to the species and includes those found in Canada).

122. *Rehn, J. A. G., and Hebard, M.*
Studies in American Tettigoniidae, V. A synopsis of the species of the genus *Conocephalus* (Xiphidium of authors) found in North America north of Mexico. Trans. Am. Ent. Soc., Phil., vol. 41, pp. 155-224, six plates, June, 1915. (Contains a Key to the species and includes those found in Canada).
123. *Rehn, J. A. G., and Hebard, M.*
The genus *Gryllus* (Orthoptera) as found in America. Proc. Acad. Nat. Sci., Philadelphia, vol. 67, Part 2, April, 1915, pp. 293-322, one plate. (The variants of *Gryllus assimilis*, Fabr., are discussed and a description is given of *G. domesticus*, Linn.; both species are recorded from various localities in Canada).
124. *Rohwer, S. A.*
Amelastegia glabrata, Fallen, a holarctic Sawfly. Proc. Ent. Soc., Washington, vol. 17, pp. 198-199, December, 1915. (A list of the synonymy European and American. The insect has been referred to by Canadian writers as *Taxonus nigrisoma*, Norton, and *Strongylogaster abnormis* Provencher).
125. *Rohwer, S. A.*
Descriptions of new species of Hymenoptera. Proc. U.S. National Museum, vol. 49, pp. 205-249, No. 2105, July, 1915. (A new species, *Euura Cosensii*, reared from galls on *Salix humilis* at Toronto, is described).
126. *Ross, W. A.*
Insects of the year in the Niagara District. 45th Ann. Report, Ent. Soc., Ont., pp. 22-25, 1914.
127. *Ross, W. A.*
Asparagus beetle Egg-parasite. Agric. Gazette of Canada, vol. 2, pp. 1055-1056, three figures, November, 1915. (Description of a minute Chalcid fly and its remarkable life-history as a destroyer of the eggs and larvae of *Crioceris asparagi*).
128. *Ruhman, Max.*
Insect notes from the Okanagan in 1914. Proc. British Columbia Ent. Soc., No. 7, n.s., p. 7-11, July, 1915.
129. *Sanders, George E.*
Some of the benefits from spraying with Arsenates in the apple orchards of Nova Scotia. Can. Ent., vol. 47, pp. 137-141, May, 1915.
130. *Sanders, George E.*
Carnivorous habits of *Xylina Bethunei*, G. & R. Can. Ent. vol. 47, pp. 183-184, June, 1915. (This destructive Fruit-worm, when nearly full grown, was found in Nova Scotia devouring the pupae of the still more destructive Forest Tent Caterpillar, *Malacosoma disstria*).

131. *Schaeffer, Charles.*
New Coleoptera and miscellaneous notes. *Journal New York Ent. Soc.*, vol. 23, pp. 47-55, March, 1915. (A new species, *Trechus borealis*, taken in Labrador and Newfoundland, is described and a table given of the genera and species of North American Brentidae).
132. *Simms, H. M.*
Notes on the cause of the blue coloration of the blue Lycaenids. *Can. Ent.*, vol. 47, pp. 161-165, May, 1915.
133. *Skinner, Henry.*
Lycaena argiolus in America. *Ent. News*, vol. 26, p. 329. July, 1915. (The writer states his belief that the sixteen names applied to the North American forms of this wide-spread blue Butterfly under *L. pseudargiolus* only represent varieties of the European and Asiatic *L. argiolus*, Linn., and that most of them are confusing and should be dropped).
134. *Sladen, F. W. L.*
Inquiline Bumble-bees in British Columbia. *Can. Ent.*, vol. 47, p. 84, March, 1915. (Records the finding of two species of *Psithyrus* in a Bumble-bee's nest, the first new-world discovery of these insects).
135. *Sladen, F. W. L.*
Characters separating the species of the Bee genus *Coelioxys* occurring in Ontario. *Can. Ent.*, vol. 47, pp. 205-208, figs. (Separate Keys for the males and females of the species of this genus so far found in Ontario).
136. *Smith, Harrison E.*
A new genus of Tachinidae from the Canadian North-west. *Can. Ent.*, vol. 47, pp. 153-155, May, 1915. (Describes *Saskatchewania Canadensis*, taken at Farwell Creek, Sask.).
137. *Smayda, M. T.*
Notes and descriptions of Tenthredella (Hymenoptera). *Can. Ent.*, vol. 47, pp. 321-326, October, 1915. (Four new species and subspecies are described, one of which, *T. macgillivrayi*, is reported from Canada).
138. *Strickland, E. H.*
Poisoned Bait and Cutworms. *Can. Ent.*, vol. 47, pp. 201-204, July, 1915.
139. *Strickland, E. H.*
The Brown-tail Moth in New Brunswick. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 59-64, three figures, 1914-1915.
140. *Swaine, J. M.*
Descriptions of new species of Ipidae (Coleoptera). *Can. Ent.*, vol. 47, pp. 355-369, two plates, November, 1915. (Nine new species are fully described, three taken in Canada).
141. *Swaine, J. M.*
The control of forest and shade tree insects of the farm. 45th Ann. Report, Ent. Soc. Soc. Ont., 112-116, 1914.

142. *Swaine, J. M.*
Shade-tree insects in Quebec. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 91-115, thirteen figures, 1914-1915.
143. *Swaine, J. M.*
Bark-beetle injuries to western Forests. Forestry Journal, No. 6, pp. 89-92, June, 1915.
144. *Swaine, J. M.*
A new species of *Pityogenes*. New York State Col. Forestry Tech. Pub. No. 2, pp. 8-10, November, 1915.
145. *Swett, L. W.*
Geometrid Notes—Revision of the genus *Hydriomena*, Hubn., group with long palpi. Can. Ent., vol. 47, pp. 9-11, January; 58-64, February, 1915.
146. *Swett, L. W.*
Geometrid Notes—New species and varieties. Can. Ent., vol. 47, pp. 155-158, May, 1915. (Describes a new species and two new varieties from Victoria, B.C.)
147. *Taylor, Lionel E.*
Notes on Birds likely to be of service in the destruction of Grasshoppers in the Nicola Valley. Proc. British Columbia Ent. Soc., No. 7, n.s., pp. 43-45, July, 1915. (Fifteen species of birds are referred to. In some cases 42 per cent of their food consisted of grasshoppers).
148. *Tillet, B.C.*
Mimicry—some of Nature's stratagems. Ottawa Naturalist, vol. 29, pp. 74-76, October, 1915.
149. *Townsend, C. H. T.*
New Canadian Alaskan Muscoidea. Can. Ent., vol. 47, pp. 285-292, September, 1915. (Describes seven new genera and new species, six of them from British Columbia and Saskatchewan).
150. *Treherne, R. C.*
The Insectivorous habits of the Mole in British Columbia. Agric. Gazette of Canada, vol. 2, pp. 216-217, March, 1915.
151. *Treherne, R. C.*
Notes of economic interest from British Columbia. Can. Ent., vol. 47, pp. 101-104, April, 1915.
152. *Treherne, R. C.*
The Tarnished Plant-bug, *Lygus pratensis*, Linn. Proc. British Columbia Ent. Soc., No. 7, n.s., pp. 16-18, July, 1915.
153. *Treherne, R. C.*
Shade-tree and ornamental plant insects of British Columbia. Proc. B. C. Ent. Soc., No. 7, n.s., pp. 35-41, July, 1915.

154. *Van Duzee, E. P.*
A preliminary review of the West Coast Cicadidae. Journal New York Ent. Soc., vol. 23, pp. 21-44, March, 1915. (Includes a description of *Okanagana rimosa*, Say, which occurs across the continent from Vancouver Island to Quebec.)
155. *Van Duzee, Millard C.*
Table of North American species of the Dipterous genus *Thrypticus*, with descriptions of four new species. Psyche, vol. 22, pp. 84-88, plate, June, 1915. (Includes one new species, *T. comosus*, from Toronto).
156. *Van Dyke, E. C.*
The species of *Cossonus*, Clairv. (Coleoptera) of America North of Mexico. Bull. Brooklyn Ent. Soc., vol. 10, pp. 1-23, February, 1915. (One species, *C. concinnus*, Boh., recorded from Canada is described; also *C. platalea* and *corticola*, Say, which have previously been reported from this country).
157. *Walker, E. M.*
The occurrence of *Mantis religiosa* in Canada. Can. Ent., vol. 47, p. 135, April, 1915.
158. *Walker, E. M.*
The re-discovery of *Agrion interrogatum*, Selys. Can. Ent., vol. 47, pp. 174-181, plate, June, 1915. (A full description with figures of both sexes of this Dragon-fly from specimens taken at Nepigon, Ont., and on the west coast of Newfoundland).
159. *Walker, E. M.*
Notes on a collection of Orthoptera from Prince Edward Island and the Magdalen Islands, Que. Can. Ent., vol. 47, pp. 339-344, October, 1915.
160. *Walker, E. M.*
Aeshna umbrosa umbrosa, Walk., in Newfoundland. Can. Ent., vol. 47, p. 386, December, 1915.
161. *Walker, E. M.*
Notes on *Stairophlebia reticulata*, Burm. Can. Ent., vol. 47, pp. 387-395, plate, December, 1915. (A study of the structural characters of this Dragonfly, and descriptions of two new subspecies).
162. *Walker, E. M.*
Notes on the Odonata of the vicinity of Go Home Bay, Georgian Bay, Ontario. Contributions to Canadian Biology, being studies from the Biological Stations of Canada, 1911-1914, Fasciculus II—Fresh Water Fish and Lake Biology, pp. 53-94, seven plates and one figure, Ottawa, 1915. (Notes on the habits and distribution of 68 species, and descriptions of many of the nymphs).
163. *Wallis, J. B.*
Some Manitoban Water-beetles. Can. Ent., vol. 47, pp. 169-174, June, 1915.

164. *Webster, F. M.*
Importance of observations on apparently unimportant insects. *Can. Ent.*, vol. 47, pp. 69-73, March, 1915. (Relates a series of instances which casual observations of little-known species proved highly useful when the insects in question were found to attack cultivated plants).
165. *Weiss, Harry B.*
The Symmetry of Insects. *Can. Ent.*, vol. 47, pp. 88-89, March, 1915. (Considers that the aesthetic appreciation of insects is largely due to their bilateral symmetry, as well as to other factors).
166. *Weiss, Harry B.*
Some curious old beliefs about Insects. *Can. Ent.*, vol. 47, pp. 277-279, September, 1915.
167. *Weiss, Harry B.*
The establishment of foreign insects in spite of inspection. *Can. Ent.*, vol. 47, pp. 313-315, October, 1915.
168. *Weiss, Harry B.*
Some old classifications of Insects. *Can. Ent.*, vol. 47, pp. 369-376, November, 1915. (Briefly describes the systems proposed by Aristotle (B.C.384) and other ancient naturalists down to the end of the eighteenth century).
169. *Wheeler, W. M.*
A new Bog-inhabiting variety of *Formica fusca*, Linn. *Psyche*, vol. 22, pp. 203-206, December, 1915. (The new variety, named *algida*, is recorded from Kenora, Ont.; Saguenay River, Anticosti and Mingan Islands, Que.; Digby, N.S.; Newfoundland and Labrador. A list is also given of other species of ants found in cold bogs in the northern States and British America).
170. *Wilkerson, G. E.*
Insect pests in greenhouses. *Proc. British Columbia Ent. Soc.*, No. 7, n.s., pp. 25-29, July, 1915.
171. *Wilson, H. F.*
A synopsis of the Aphid tribe *Pterocommini*. *Annals Ent. Soc. America*, vol. 8, No. 4, pp. 347-358, December, 1915. (Gives a key to the species, figures of nectaries and antennae, and descriptions of various forms. *Pterocomma smithiae*, Monnell, *Aphis salicis*, Harris, is recorded from Canada).
172. *Wilson, Tom.*
The outbreak of Locusts of 1914. *Proc. British Columbia Ent. Soc.*, No. 7, n.s., pp. 41-43, July, 1915. (An account of wide-spread injury, chiefly by *Melanoplus affinis* and *femur-rubrum*. Large numbers of Blister-beetles, *Cantharis cyanipennis*, were found feeding upon the egg masses).
173. *Winn, A. F.*
Butterflies in nature and in books. 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 65-71, 1914-1915.

174. *Winn, A. F., and Beaulieu, G.*

A preliminary list of the Insects of the Province of Quebec, Part ii, Diptera. Supplement to 7th Annual Report, Quebec Soc. Prot. Plants, etc., pp. 107-159, 1915. (The list includes 50 families, about 320 genera and nearly 800 species, and is the most complete of any yet published for the Province of Quebec).

175. *Wolley Dod, F. H.*

Further notes on Alberta Lepidoptera, with description of a new species. Can. Ent., vol. 47, pp. 1-8, January; 33-42, February; 122-134, April, 1915. (Continuation of a series of papers; the present notes numbering from 603 to 683. *Rhizagrotis querula* taken in Alberta (p. 36) is the new species described).



Bibliography of Canadian Botany for the Year 1915.

By A. H. MacKAY, LL.D., F.R.S.C.

(Read by title, May Meeting, 1916).

ADAMS, J.

"Medicinal plants and their cultivation in Canada." Canada Agr. Expr. Farms Bull. II: 23: 1-60, f. 1-36. 1915.

AGRICULTURAL GAZETTE OF CANADA.

(Contains numerous articles from each province of the Dominion in which Botany is applied to Agriculture, Horticulture, School-gardening, etc.) Monthly, 100 pp. Editor, J. B. Spencer, Ottawa.

ANDREWS, A. LeROY.

"Notes on North American *Sphagnum*. VI." (Includes Canadian species and habitats.) Bryolog. XVIII: 1-6, Jan., 1915.

ANDREWS, A. LeROY.

"*Odontoschisma macounii* in Iceland." (Species named after Canadian botanist.) Bryolog. XVIII: 51, 52, July, 1915.

ARTHUR, J. C.

"Cultures of *Uredineae* in 1912, 1913 and 1914." (20 species previously reported and 5 now for the first time. Reference to Canadian co-operative work.) Mycologia VII: 61-89, Mar., 1915.

ARTHUR, JOSEPH CHARLES.

"New species of *Uredineae* IX." (Includes Canadian species and habitats—among them, *Puccinia Fraseri* sp. nov. on *Hieracium scabrum*, Pictou, Nova Scotia). Bull. Torr. Boy. Club XLII: 585-593., Oct., 1915.

BAILEY, L. H.

"The Standard Cyclopedia of Horticulture." III: 1201-1760, pl. 40-60 + f., 1471-2047, New York, 12 May, 1915.

BAILEY, L. W. }
 MACKAY, A. H. }

"Diatoms from the eastern coasts of Vancouver Island, B.C., Canada." (About 330 sp. and var. with notes on distribution, etc., and measured dimensions with brief formulated descriptions). Roy. Soc. Can. III: Vol. IX: (Sect. IV): pp. 141-173, 1915.

BLAKE, S. F.

"*Moneses uniflora* Var. *reticulata*." (A British Columbian variety). Rhodora XVII: 28, 29, Jan., 1915.

BLAKE, S. F.

"An *Atriplex* new to North America." (*A. maritima* E. Hallier, in Magdalen Islands, Prince Edward Island and N. Brunswick). *Rhodora* XVII: 83-86, 1, 2 f., Apr., 1915.

BRAINERD, EZRA.

"*Viola septentrionalis* in British Columbia." (Also reported from eastern Ontario). *Rhodora* XVII: 70, 71, Mar., 1915.

BRINKMAN, A. H.

"Rambles among the Canadian Rockies." *Bryolog.* XVIII: 35-37, May, 1915.

BRINKMAN, A. H.

"Rambles in the Canadian Rockies, II." (Near Banff). *Bryolog.* XVIII: 49-51, 21 Sept., 1915.

BULLER, A. H. R.

"The Fungus Lore of the Greeks and Romans." *Trans. Brit. Mycolog. Soc.*, May, 1915.

BULLER, A. H. R.

"Presidential Address, Section IV, Royal Society of Canada," Ottawa, 1915.

BULLER, A. H. R.

"Spore discharge in the *Uredineae* and *Hymenomycetes*." *British Association for Advancement of Science*, 1915.

BULLER, A. H. R.

"Die Erzeugung und Befreiung der Sporen bei *Coprinus sterquilinus*." (University of Manitoba, Winnipeg). *Jahrbuch Wiss. Bot.* LVI: 299-329, pl. 2, 3 + f. I, 2, 1915.

BURT, E. A.

"The *Thelephoraceae* of North America, IV." (Canadian species included). *Ann. Rep. Missouri Bot. Gard.* II: 627-658, pl. 21., Sept., 1915.

CAMPBELL, R. H.

"The relation of forestry to the development of the country." (Description of some European forest conditions). *Can. For. Jour.* XI: 35-39, 4 photogr., Mar., 1915.

CAMPBELL, R. H.

"Timber in Canada." *Can. For. Jour.* XI: 265-268, Nov., 1915.

CAMPBELL, R. H.

"Increased production and forest management." *Can. For. Jour.* XI: 289-292, Dec., 1915.

CANADIAN FORESTRY JOURNAL.

"The pine forest at Oka." (An illustrated sketch). Can. For. Jour. XI: 217-219, Oct., 1915.

CANADIAN SEED GROWERS' ASSOCIATION.

"Catalogue of registered and improved seed produced in 1914." (Offered for sale: Canadian Building, Ottawa). 16 pp., 1915.

CHAMBERS, C. O.

"Some littoral *algae* of Puget Sound." (References to Canadian species). Am. Mid. Nat. III: 91-98, 10 Jul., 1913.

CHRISTIE, H. R.

"The forests of central British Columbia." For. Quart., XIII: 495-503, Dec., 1915.

CLARK, GEO. H.

"Weeds and weed seeds—illustrated and described." (Those of Canada figured as well as described with life history). Dept. Agr. Can. Bull. No. S-8, pp. 67, Ottawa, Dec., 1914.

CONKLIN, GEO. H.

"Hepatic Note." (Includes list of liverworts from Quebec and British Columbia). Bryolog., XVIII: 23 Mar., 1915.

CONNELL, A. B.

"Some aspects of the northern plain forest region of Canada." (Deals with the forest region north of the prairies in Manitoba, Saskatchewan and Alberta, and gives the tree associations in (1) boulder clay slopes, (2) sand ridges and (3) swamps). Forestry Quarterly XIII: 31-34, 1915.

CRIDDLE, NORMAN.

"A note on the colours of tumbling mustard seed." (Seeds of individual plants all either yellowish or greenish suggesting that crosses do not follow the Mendelian law). Ottawa, Nat., XXVIII: 138, 139, Jan., 1915.

DEARNESS, J.

"The myxos of Middlesex." (In the province of Ontario). Ontario Nat.. Sci. Bull. VII: 3-10, 1912.

DERICK, C. M.

"Dr. David Pearce Penhallow." (A biographical sketch of the Canadian botanist). Canadian Record of Science IX: 387-390. Portrait, Jan., 1915.

EVANS, ALEXANDER W.

"Notes on North American *Hepaticae*, VI." (Includes Canadian species and habitats). Bryologist, XVIII: 87-91, Sept., 1915.

EXPERIMENTAL FARMS, CANADA.

"Report of Division Field Husbandry." (From 14 stations in Canada. Experiments with crops and fertilizers). Directors' Report, 1914, pp. 139-292, Ottawa, 1915.

FARWELL, O. A.

"The correct name for the hemlock spruce." (A common Canadian species). Bull. Torr. Bot. Club. XL: 621-629, 8 Jan., 1915.

FARWELL, O. A.

"The hemlock spruce." (A reply to Alfred Rehder, in *Rhodora*, March, 1915). *Rhodora* XVII: 164-168. Sept., 1915.

FARWELL, O. A.

"Range extension of *Ceanothus sanguineus*." (Central Canadian habitat). *Rhodora* XVII: 229, 230. Dec., 1915.

FERNALD, M. L.

"Some new or unrecorded *Compositae* chiefly of Northeastern America." (Some thirty or more new or rare species and varieties in Canada and Newfoundland). *Rhodora* XVII: 1-20. Jan., 1915.

FERNALD, M. L.

"The North American representatives of *Dryopteris spinulosa*, var. *dilatata*." (A Canadian species also which he names *Dryopteris spinulosa* (Mull) Kuntze, var. *americana* (Fischer), new combination). *Rhodora* XVII: 44-48. Feb., 1915.

FERNALD, M. L.

"Review of Norman Taylor's FLORA OF THE VICINITY OF NEW YORK, A CONTRIBUTION TO PLANT GEOGRAPHY." (References to habitats and species of Canada in the criticism). *Rhodora* XVII: 62-70, Mar., 1915.

FERNALD, M. L.

"*Botrychium angustisegmentum*." (Found in eastern Canada and should not be confounded with *B. lanceolatum* of Greenland and mountains of B.C.). *Rhodora* XVII: 87, 88. Apr., 1915.

FERNALD, M. L.

"Michaux's *Panicum muricatum*." (References to Canadian specimens). *Rhodora* XVII: 104-107. June, 1915.

FERNALD, M. L.

"The American variations of *Lycopodium annotinum*." (Var. *acrifolium* Nfld. and eastern Canada, also *pungens*. var. *alpestre* in B.C.). *Rhodora* XVII: 123-125. June, 1915.

FERNALD, M. L.

"A new *Carex* from Newfoundland." (*Carex misandroides* Fernald). *Rhodora* XVII: 158, 159. Aug., 1915.

FERNALD, M. L.

"The American Ostrich Feather Fern." (Should be *Matteuccia nodulosa* Michx.—n. comb. instead of *Struthiopteris pennsylvanica* or *S. germanica*, var.). *Rhodora* XVII: 161-164, Sept., 1915.

FERNALD, M. L.

"The identity of *Circaea latifolia* and the Asiatic *C. quadrisulcata*." (A Canadian species). *Rhodora* XVII: 222-224. Nov., 1915.

FERNALD, M. L.

"The characters and range of *Carex laevivaginata*." (A Canadian species). *Rhodora* XVII: 231, 232. Dec., 1915.

FERNALD, M. L. and }
ST. JOHN, HAROLD. }

"Some anomalous species and varieties of *Bidens* in eastern North America." (Some 6 new sp. and var. mostly from eastern Canada and Nfld.). *Rhodora* XVII: 20-25. Jan., 1915.

FERNALD, M. L. }
ST. JOHN, HAROLD. }

"The occurrence of *Botrychium virginianum* var. *europaeum* in America." (From Nfld. Labrador, Gaspé, Thunder Bay, etc.). *Rhodora* XVII: 233, 234. Dec., 1915.

FERNALD, M. L. }
WIEGAND, K. M. }

"The genus *Euphrasia* in North America." (9 species and 3 varieties—nearly all Canadian). *Rhodora* XVII: 181-201. Oct., 1915.

FRASER, W. P.

"Notes on *Uredinopsis mirabilis* and other rusts." *Mycologia* IV: 25-28. 1914.

FRASER, W. P.

"The cereal rusts." *Ann. Rep. Quebec Soc. Protect. Plants from Insects and Fungi* VII: 116-120. 1915.

FROTHINGHAM, E. H.

"The Eastern hemlock *Tsuga canadensis*." (A common Canadian species). *U. S. Dept. Agr. Bull.* 152: 1-43. pl. 1-5 + f. 1-3. 3 Feb., 1915.

GREENMAN, J. M.

"Descriptions of North American *senecioneae*." (Includes Canadian species). *Ann. Missouri Bot. Gard.* I: 263-290. pl. 10-14. 30 Sept., 1914.

GREENMAN, J. M.

"Monograph of the North and Central American species of the genus *Senecio*—Part II." *Ann. Missouri Bot. Gard.* II: 573-626. pl. 17-20. Sept., 1915.

GUSSOW, H. T.

"The control of Potato diseases." (Circular No. 9, Division of Botany, Dept. Agr., Ottawa). 8 pp., Ottawa, Govt. Print. Bureau, 1915.

GUSSOW, H. T.

"The control of potato diseases." (Mainly by spraying). Agr. Gaz. Can. II: 323, 324. Ottawa, April, 1915.

GUSSOW, H. T.

"Potato canker—*Chrysophlyctis endobiotica*—imported into Canada." Dom. Canada Dept. Agr. Exp. Farms, Circ. I: 3, 4, May, 1912.

GUSSOW, H. T.

"Report from Division of Botany." (Plant pathology, experimental work, economic botany, miscellaneous). Director Exper. Farms Rep., 1914, pp. 829-849. Ottawa, 1915.

HARRISON, F. C.

"Nitro-cultures and their commercial applications." (Tests of nitro-bacterial growths on Ashby's agar, wood ash sugar, and dipotassium phosphate agar, with the addition of saccharose, dextrin, maltose and mannite). Roy. Soc. Can. III, Vol. IX (Sect. IV): pp. 219-223, 1915.

HARRISON, F. C. }
VANDERLECK, J. }

"A study of some organisms which produce black fields in Aesculin-bilesalt media." (From more than 1,000 milk dealers or producers of Quebec 9 plates each were made—3 aesculin-bilesaltagar, etc., from which bacterial colonies were selected for the identification of the colon-aerogenes). Roy. Soc. Can. III: Vol. IX. (Sect. IV): pp. 208-217, tables and 4 pl. of figs. 1915.

HENRY, J. K.

"A hybrid rose." (*Rosa gymnocarpa* Nutt, \times *R. nulkana* Presl.) Ottawa Nat. XXIX: 78. Oct., 1915.

HERIOT, W.

"The *Rosaceae* and *Leguminosae* of Galt, Ontario." Ontario Nat. Sci. Bull. VII: 28-34. 1912.

HITCHCOCK, A. S.

"A text book of grasses." (Includes Canadian species). i-xvii 1-276, f. 1-63 fron. New York. 1914.

HOWE, R. H.

"A list of lichens collected in Newfoundland, with critical notes on the family *Usneaceae*." Plant World XVII: 135-153. May, 1914.

HOWE, R. H. JR.

"The Usneas of the world, 1752-1914, with citations, type localities, original descriptions, and keys. Part II. South America." Bryologist XVIII: 38-43. 15 June; 52-63. f. I. 21 Sept., 1915.

HOWE, R. H., JR.

"The genus *Cetraria* as represented in the United States and Canada." Torreya XV: 213-230. f. 1-10. 4 Nov., 1915.

JENNINGS, O. S.

"Notes on the Pteridophytes of northwestern Ontario." *Am. Fern. Jour.* V: 33-39. May, 1915.

KINDLE, E. M.

"Limestone solution on the bottom of Lake Ontario." (*Cladophora profunda* Brand, forma *ima* growing on honeycombed corroded limestone slabs from a depth of 150 feet in Lake Ontario). *Amer. Jour. Sci.* XXXIX: 651-656, figs. 3. 1915.

KLUGH, A. B.

"A zonal habitat." (Ontario) *Ont. Nat. Sci. Bull.* VII: 64. 1912.

KLUGH, A. B.

"The plant formations of the Bruce Peninsula." (In Ontario). *Ont. Nat. Sci. Bull.* VII: 64. 1912.

KLUGH, A. B.

"The hydrophytic formations of Lake Opinicon." (In Ontario). *Ont. Nat. Sci. Bull.* VII: 63, 1912.

KLUGH, A. B.

"The flora of the sand dunes of Prince Edward County." (In Ontario). *Ont. Nat. Sci. Bull.* VII: 63. 1912.

KNOWLTON, CLARENCE H.

"Plants and Plant Societies at Roque Bluffs, Maine." (References to adjacent Canadian species). *Rhodora* XVII: 145-155. Aug., 1915.

LAWLOR, JAMES.

"Twenty Canadian trees." (Illustrated booklet prepared and distributed by the Canadian Forestry Association). Pp. 24, July, 1915.

LE NATURALISTE CANADIEN.

"*Nymphaea (Nuphar) Americana* (Provancher) Miller and Stanley." (Editorial article—L'Abbé V. A. Huard, Directeur. History of nomenclature and correction). *Le Naturaliste Canadien* XLI: 97-99. Jan., 1915.

LORENTZ, ANNIE.

"List of *Hepaticae* to be expected in New England." (Includes references to species and habitats in Canada). *Bryol.* XVIII: 24-26 Mar., 1914.

LLOYD, F. E.

"Vegetation of Canada." 20th Century Canada, London, 1915.

MACBRIDE, J. FRANCIS.

"*Sisymbrium brachycarpon* and Allies." (References to Canadian habitats). *Rhodora* XVII: 138-141. July, 1915.

MACKAY, A. H.

"Local 'Nature' observations, Nova Scotia, 1914." *Jour. Education* III Vol. VIII: No. 3: pp. 56-63. Apr., 1915.

MACKAY, A. H.

"Bibliography of Canadian Botany for the year 1914." (About 130 titles). Roy. Soc. Can. III: Vol. IX (Sect. IV): pp. 251-261. (May, 1915). 1916.

MACKAY, A. H.

"The Phenology of Nova Scotia, 1914." (Compiled from observations in about 350 public schools, and classified into ten regions). Trans. Nov. Scot. Inst. Sci. XIV: 57-65. 1915.

MACKAY, A. H.

"Phenological observations by schools." (A sketch of the Nova Scotian system). Agr. Gaz. Can. II: 690, Ottawa. July, 1915.

MACKENZIE, KENNETH KENT.

"Notes on *Carex*—VIII." (Includes Canadian species and habitats). Bull. Torr. Bot. Club. XLII: 405-422. July, 1915.

MACKENZIE, KENNETH KENT.

"Notes on *Carex*—IX." (Includes Canadian species and habitats, among which—*Carex festivella* sp. nov. Sask. to East B.C.) Bull. Torr. Bot. Club. XLII: 603-621. Nov, 1915.

MACOUN, W. T.

"Report from Division of Horticulture." (From 16 stations in Canada). Director's Report, 1914, pp. 481-748. Ottawa, 1915.

MALTE, M. O.

"Report from Division of Forage Plants." (From 15 stations in Canada). Dir. Exper. Farms. Rep. 1914, pp. 877-950.

MALTE, M. O.

"Climatic and Soil Conditions as they influence plant life." (At meeting Bot. Br. of Ott. Field Nat. Club. In 4 months collected 200 sp. of grass, 170 appearing to be indigenous to Canada, for Panama Exhibit). Ottawa Nat. XXVIII: 39, 140. Jan., 1915.

MALTE, M. O. }

MACOUN, J. M. }

"Hybridization in the genus *Viola*." (In a hybrid between two violet species the faculty of producing the normal amount of germinable seed is most conspicuously reduced. About 70 hybrids indicated). Ottawa Nat. XXVIII: 145-150. Feb; 162-168. Mar., 1915.

MALTE, M. O. }

MACOUN, W. T. }

"Growing field root, vegetable and flower seeds in Canada." Dept. Agr. Can. Bull. 22 2nd Series, pp. 15. Ottawa, 1915.

MATHEWS, F. SCHUYLER.

"Field Book of American Books and Shrubs." (Includes Canadian species). Pp. XVI-465. Ill. \$2.00, Leather \$2.50. Postage 15 cts. G. P. Putnam's Sons, New York.

MATTHEWS, F. S.

"Field Book of American trees and shrubs." (Includes Canadian species)
v-xvii-1-464. New York. 1915.

MCCUBBIN, W. A.

"The edible toadstools—the smooth *Lepiota*." Ontario Nat. Sci.
Bull. VII: 53-56, Illustr. 1912.

MCCUBBIN, W. A.

"Experimental results on peach canker." Ann. Rep. Ontario Fruit
Grower's Ass'n. XLVI: 28-32. 1915.

MELVILLE, E.

"The Downy Mildews." Ann. Rep. Quebec Soc. Protect. Plants,
Insects and Fung. diseases VI: 33-38, Illustr. 1914.

MILLER, C. R.

"Fresh-water *algae* occurring in the vicinity of the Island of Montreal."
Canadian Rec. Sci. IX: 391-425. Jan., 1915.

MILLAR, W. N.

"Forest investigations in Canada." (Proposal for a national organiza-
tion for technical investigations). For. Quart. XIII: 504-521. Dec.,
1915.

MITCHEL, F.

"Weed migration." Ontario Nat. Sci. Bull. VII: 56, 57. 1912.

MORRIS, FRANK.

"Gleanings in Fernland." (In south Ontario). Ottawa Nat. XXIX:
105-110. Dec., 1915.

MURRILL, WILLIAM A.

"Illustrations of Fungi—XX." (Includes Canadian species with colored
illustrations). Mycologia VII: 115-120. May, 1915.

MURRILL, WILLIAM A.

"Illustrations of Fungi—XXI." (Colored figures including Canadian
species). Mycologia VII: 163-167. July, 1915.

MURRILL, WILLIAM A.

"The genus *Chilocybe* in North America." (Includes Canadian species).
Mycologia VII: 256-283, Illustr., 164-166. Sept., 1915.

MURRILL, WILLIAM A.

"Illustrations of *Fungi*—XXII." (Includes Canadian species). My-
cologia VII: 221-226. Sept., 1915.

PAYNE, F. F.

"Phenological Observations, Canada, 1914." (Leafing and flowering
of plants, migration of birds, etc.). Roy. Soc. Can. III. Vol. IX: App.
LXXIII-LXXXIX. 1915.

PRETTIE, R. D.

"The relation of forestry to irrigation." (From a western Canadian point of view). Can. For. Jour. XI: 280-283. Dec., 1915.

REHDER, ALFRED.

"The name of the hemlock spruce." (A reply to Oliver A. Farwell in Bull. Torr. Bot. Club XLI: 621-629. The name *Tsuga Canadensis* is more correct according to the rules of nomenclature than *Tsuga americana*). Rhodora XVII: 59-62. Mar., 1915.

RYDBERG, P. A.

"Phytogeographical notes on the Rocky Mountain region IV. Forests of the Subalpine and Montane zones." (Includes Canadian habitats and species). Bull. Torr. Bot. Club. XLII: 11-25. Jan., 1915.

RYDBERG, P. A.

"Notes on *Rosaceae*, IX." (Includes Canadian habitats and species). Bull. Torr. Bot. Club, XLII: 117-160. Mar., 1915.

RYDBERG, P. A.

"Notes on *Rosaceae*, X." (Includes Canadian species and habitats—93 tentative hybrids). Bull. Torr. Bot. Club. XLII: 463-479. Aug., 1915.

RYDBERG, P. A.

"Phytogeographical notes on the Rocky Mountain region V, Grasslands of the Subalpine and Montane zones." (Includes Canadian species). Bull. Torr. Bot. Club. XLII: 629-642. Nov., 1915.

SACCARDO, P. A.

"*Notae mycologicae*." (Includes Canadian species collected by John Dearness, London, Ontario). Ann. Myc. XIII: 115-138. 10 June, 1915.

SAUNDERS, CHAS. E.

"Report from Cereal Division." (From 18 stations in Canada). Directors Report, 1914, pp. 749-823. Ottawa, 1915.

SHARP, SEYMOUR, S.

"Notes on the determination of Rocky Mountain conifers." (Includes western Canadian species. Determinations based on cross sections of the leaves). Torreyia XV: 1-8. Jan., 1915.

ST. JOHN, HAROLD.

"An insular variety of *Solidago sempervirens*." (*S. sempervirens* L., var. *azorica* (Hochst). has the cauline leaves sessile, ovate or deltoid-lanceolate, broadest just above the base tapering into a blunt attenuate tip). Rhodora XVII: 26, 27, Jan., 1915.

ST. JOHN, HAROLD.

"*Rumex persicarioides* and its allies in North America." (Includes Canadian habitats for it and *R. maritimus* and its varieties *fueginus* and *athrix*). Rhodora XVII: 73-83, f. 1-6. Apr., 1915.

ST. JOHN, HAROLD.

"*Elymus arenarius* and its American representatives." (References to Canadian habitats). *Rhodora* XVII: 98-103. May, 1915.

STOPES, DR. MARIE.

"The farm ledges" carboniferous flora of St. John, New Brunswick." (150 pages, 30 plates). Department of Mines, Geol. Survey of Canada. Memoir 41. 1915.

TULLEY, C. J. }
DICKSON, J. R. }

"Forestry in Canada." (At meeting Bot. Br. Ottawa F-Nat. Club. Mr. Tulley said there were 31 organized Forest Reserves in Canada aggregating 45,800 sq. m. From Indian Head 3,000,000 young trees were distributed in 1914. Forest research laboratories at McGill). *Ottawa Nat.* XXIX: 29, 30. May, 1915.

VAN HORNE, A.

"Some rare *fungi* found at St. Andrews." (New Brunswick). *Canadian Record of Science*, IX: 328-338. April, 1914.

VICTORIN, M.

"La flore du Temiscouata." (Rapport sur une nouvelle exploration botanique de ce comté de la Province de Quebec. Chapitres I et 2 à suivre). *Nat. Canadian* XLI: 99-108. Jan., 1915; 115-119, Fev.; 132-138, Mar.; 148-155, Avril; 165-170, May; 181-188, Juin; XLII: 6-12 Juli; 18-29, Aout; 24-44, Sept.; 51-59, Oct.; 68-79, Nov., 1915.

VICTORIN, M.

"Random botanical notes from Portneuf County, Quebec." (Includes description and figures of *Aster linariifolius* L., var. *Victorinii* Fernald). *Ottawa Nat.* XXVIII: 155-160. Feb., 1915.

VICTORIN, M.

"A propos de la pigmentation pathologique des feuilles et des fleurs de certaine espèces d'aubépine." (Province of Quebec). *Le Naturaliste Canadien* XLI. 161-165. May, 1915.

VROOM, J.

"The stemless violets." (Six species of the Atlantic Provinces). *Educational Review* No. 336, pp. 259, 260. St. John, N.B. May, 1915.

WADDELL, JOHN.

"Nova Scotian examinations in Botany." (Critical comments as examiner). *Jour. Education* III: vol. VIII: No. 4: p. 222. Oct., 1915.

WHITE, J.

"*Liliaceae* of County Peel." (Ontario). *Ont. Nat. Sci. Bull.* VII: 37, 38. 1912.

WHETZEL, H. H.

"Ginzeng and its diseases." *Ontario Nat. Sci. Bull.* VII: 22-28. f. 1-4. 1912.

*Bibliography of Canadian Zoology.**(Exclusive of Entomology.)*

By E. M. WALKER, F.R.S.C.

(Read by Title, May Meeting, 1916.)

INVERTEBRATA.

PROTOZOA.

MAVOR, J. W.

Studies on the Sporozoa of the fishes of the St. Andrew's Region.

Contributions to Canadian Biology, 1911-1914. Fasciculus 1—Marine Biology. Supplement to the 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 25-38, with Plate IV.

Describes one Coccidian and four Myxosporidian parasites of fishes from this region.

On the occurrence of a Trypanoplasm, probably *Trypanoplasma borreli* Laveran et Mesnil, in the blood of the Common Sucker, *Catostomus commersonii*.

Journal of Parasitology, September, 1915, vol. ii, pp. 1-6, with one plate.

Describes the structure of this Flagellate and the condition of the host in which it was found.

WICKWARE, A. B.

Is *Leucocytozoon anatis* the cause of a new disease in ducks?

Parasitology, June 1915, vol. viii, no. 1, pp. 17-21, with plates I-III.

Describes the symptoms and etiology of a new infectious disease of ducks and the occurrence in the blood of affected animals of a new Flagellate, *Leucocytozoon anatis*.

VERMES.

COOPER, A. R.

Contributions to the life-history of *Proteocephalus ambloplitis* Leidy, a parasite of the Black Bass.

Contributions to Canadian Biology, 1911-1914. Fasciculus 11—Fresh-water fish and lake biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 177-194, with plates XIX-XXI.

An account of the anatomy of the adult of this tapeworm and of various larval stages, and its mode of occurrence in the host.

Trematodes from marine and fresh-water fishes including one species of ectoparasitic Turbellarian.

Transactions of the Royal Society of Canada, Series III, 1915, vol. IX, Sec. IV, pp. 181-205, with Plates I-III.

Descriptive notes on 13 species from marine fishes and sixteen species from fresh-water fishes.

DOUTHITT, HERMAN.

Studies on the Cestode family Anoplocephalidae.

Illinois Biological Monographs, January, 1915, vol. 1, no. 3, pp. 1-86, with plates I-VI.

An important taxonomic study of this family of tapeworms.

Anoplocephala infrequens n. sp., parasitic in *Geomys bursarius*, is recorded from Emerson, Man.

FRASER, C. McLEAN.

The swarming of *Odontosyllis*.

Transactions of the Royal Society of Canada, Series III, 1915, vol. IX, Sec. IV, pp. 43-49.

Observations on the time of swarming of *Odontosyllis phosphorea* (Moore) and the concurrent meteorological conditions.

RYERSON, MISS C. G. S.

Notes on the Hirudinea of Georgian Bay.

Contributions to Canadian Biology, 1911-1914. Fasciculus 11—Fresh-water fish and lake biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 165-175.

Gives descriptive and ecological notes on the 17 species of leeches found in this region.

WHITE, H. T.

Bryozoa of the Georgian Bay Region

Contributions to Canadian Biology, 1911-1914. Fasciculus 11—Fresh-water fish and lake biology. Supplement to the 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 195-199.

Gives descriptive and ecological notes on the ten species and varieties, with a key to the species of *Plumatella*.

ARTHROPODA.

DE DEÉS, EUGENE DADAY.

Monographie systématique des Phyllopoques conchostraces. Annales des sciences naturelles. Zoologie, Octobre, 1915, tome XX, nos. 4 à 6, pp. 193-330. (Continued from 1914).

Cyzicus mexicanus (Cls.) is reported from Lake Winnipeg (previously described and recorded from this locality by W. Baird as *Estheria caldwelli*).

HANSEN, H. J.

The Crustacea Euphausiacea of the United States National Museum.

Proceedings of the United States National Museum, 1915, vol. XLVIII, no. 2065, pp. 59-114, with plates 1-4.

The following species are recorded from Canadian localities: *Meganyctiphanes norvegica* M. Sars, *Euphausia pacifica* H. J. Hansen, *Thysanocessa longipes* Brandt, *T. spinifera* Holmes, *T. inermis* Krøyer and *T. raschii* M. Sars.

HUNTSMAN, A. G.

A new Caprellid from the Bay of Fundy.

Contributions to Canadian Biology, 1911-1914. Fasciculus I—Marine Biology. Supplement to the 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 39-42, with plates V and VI.

Describes *Mayerella limicola*, new genus and species.

The fresh-water Malacostraca of Ontario.

Contributions to Canadian Biology, 1911-1914. Fasciculus II—Fresh-water fish and lake biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 145-163, with 13 text-figures.

Gives keys to the orders, genera and species and notes on the distribution of the latter.

PRINCE, EDWARD E.

The New Zealand Peripatus.

The Ottawa Naturalist, January, 1915, vol. XXVIII, no. 10, pp. 134-138.

A popular account of this interesting animal, living specimens of which were brought to Canada by the writer.

SARS, G. O.

Entomostraca of Georgian Bay.

Contributions to Canadian Biology, 1911-1914, Fasciculus II—Fresh-water fish and lake biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 221-222.

An annotated list of 16 species occurring in a series of surface tow-nettings made at the Georgian Bay Biological Station.

STOCK, V.

On some of the Parasitic Copepods of the Bay of Fundy Fish.

Contributions to Canadian Biology, 1911-1914. Fasciculus I—Marine Biology. Supplement to the 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 69-71.

Gives notes on the host relations of certain Copepoda, particularly of the families Caligidae and Argulidae.

WILSON, CHARLES BRANCH.

North American Parasitic Copepods belonging to the Lernaeopodidae, with a revision of the entire family.

Proceedings of the United States National Museum, 1915, Vol. 47, no. 2063, pp. 565-729, with plates 25-56 and figures 1-15.

Charopinus dentatus Wilson, *Clavella parva* Wilson and *Clavellopsis robusta* Wilson are reported from Canadian waters. *Brachiella pinguis* n. sp. was taken south of Newfoundland.

MOLLUSCA.

DALL, WILLIAM H.

Notes on the Semelidae of the West Coast of America, including some new species.

Proceedings of the Academy of Natural Sciences of Philadelphia, January 1915, vol. LXVII, part 1, pp. 25-28.

Includes one Canadian species from British Columbia, *Semele rubropicta*.

DETWEILER, JOHN D.

Preliminary notes on the Mollusca of St. Andrew's and vicinity, New Brunswick.

Contributions to Canadian Biology, 1911-1914. Fasciculus 1.—Marine Biology. Supplement to the 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 41-46. An annotated list of 57 species.

LATCHFORD, F. R. (L).

Conchological Notes.

The Ottawa Naturalist, June-July, 1915, vol. XXIX, Nos. 3 and 4, pp. 51-52.

Given notes on certain Unionidae of the Hudson Bay drainage area.

ROBERTSON, A. D.

The Mollusca of Georgian Bay.

Contributions to Canadian Biology, 1911-1914. Fasciculus II—Fresh water fish and lake biology. Supplement to the 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 95-111, with plates X-XII.

Descriptive notes are given on the various species with observations on their habitats and a key to the families, genera and species.

VANATTA, E. G.

Two new varieties of Valvata.

The Nautilus, January, 1915, vol. XXVII, no. 9, pp. 104-105, with 4 text figures.

Valvata tricarinata infracarinata n. var. is recorded from Hamilton Ont.

ECHINODERMATA.

OKSHIMA, HIROSHI.

Report on the Holothurians collected by the United States Fisheries Steamer "Albatross" on the North-western Pacific during the summer of 1906.

Proceedings of the United States National Museum, 1915, vol. 48, no. 2073, pp. 213-291, with plates 8-11.

The following species are recorded from Canadian waters: *Pannychia moseleyi virgulifera* n. subsp., *Cucumaria chronhjelmi* Théel, *C. calcigera* (Stimpson) and *Chiridota albatrossii* Edw.

VERTEBRATA

PISCES (Fishes).

ANDERSON, E. M.

Fishes collected in Atlin, 1914.

Report of the Provincial Museum of Natural History for the year 1914. Province of British Columbia, 1915, p. F21.

Four species of fish and one batrachian are recorded.

BENSLEY, B. A.

The fishes of Georgian Bay.

Contributions to Canadian Biology, 1911-1914. Fasciculus II—Fresh water fish and lake biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 1-51, with plates I and II and 6 text figures.

A descriptive account of the fishes of this region, with notes on habits, distribution etc., including a description of the topography of the vicinity of Go Home Bay.

FRASER, C. McLEAN.

On *Clupea pallasii* Cuvier and Valenciennes.

Transactions of the Royal Canadian Institute, 1915, Vol. XI, part 1, no. 25, pp. 97-108, with plates VIII and IX.

Discusses the spawning habits and development of this herring.

Ichthyological notes on: i, *Ophiodon elongatus* Girard; ii *Oncorhynchus keta* Walbaum; iii, The diagnosis of fish by means of the scales; iv, *Mallotus villosus* Müller.

Idem, 1915, vol. XI, part 1, no. 25, pp. 109-118, with Plate X.

HALKETT, ANDREW.

A suggestive note as to what might be brought to light about the paddlefish through deep lake dredging.

The Ottawa Naturalist, December, 1915, vol. XXIX, no. 9, pp. 114-115.

Suggests the probability of this fish inhabiting the beds of the rivers and lakes in which it normally occurs.

LINCOLN, ROBERT PAGE.

The Speckled Brook Trout.

Rod and Gun in Canada, June 1915, vol. 17, no. 1, pp. 25-29.

A popular account of this fish, describing its coloration, habits and haunts.

The Ouananiche Salmon.

Idem, August, 1915, vol. 17, no. 3, pp. 247-251.

A popular account of the characteristics, habits and habitat of this salmon and of the Sebago salmon.

The Atlantic Salmon.

Idem, September 1915, vol. 17, no. 4, pp. 344-347.

A popular account of the characteristics, habits and habitat of this fish.

The Pacific Salmon.

Idem, December, 1915, vol. 17, no. 7, pp. 687-690.

A popular account of the characteristics and habits of the various species of *Oncorhynchus*.

MARTIN, W. H.

Same experiments on the freezing and thawing of live fish.

Contributions to Canadian Biology, 1911-1914. Fasciculus 1—Marine Biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 73-75.

An account of experiments performed on the Mummichog (*Fundulus heteroclitus*).

PRINCE, EDWARD E.

The curious egg of the hagfish (*Myxine*).

The Ottawa Naturalist, December, 1915, vol. XXIX, no. 9, pp. 111-113.

Gives a description of the external features of this rarely-found object.

AMPHIBIA.

CAMERON, A. T.

Further experiments on the effect of low temperatures on the frog.

Quarterly Journal of Experimental Physiology, February, 1915, Vol. VIII, no. 4, pp. 341-346.

PIERSOL, W. H.

On the egg-laying habits of *Plethodon cinereus*.

Transactions of the Royal Canadian Institute, 1914 (May, 1915), vol. X, part 2, no. 24, pp. 121-126.

AVES (Birds).

ABBOTT, GERALD A.

Interesting sets in my shore bird collection.

The Oologist, September, 1915, vol. XXXII, no. 9, pp. 149-150.

Contains records from several localities in Canada and Newfoundland.

ANDERSON, ERNEST M.

Nesting of the Bohemian Waxwing in Northern British Columbia.

The Condor, July-August, 1915, vol. XVII, no. 4, pp. 145-148, with figs, 50 and 51.

Supplement to the birds published in the Annual Report 1913—Errata.

Report of the Provincial Museum of Natural History for the year 1914. Province of British Columbia, 1915, pp. F17-F18.

Birds collected and observed in the Atlin district, 1914.

Idem, 1915, pp. F8-F17.

An annotated list of 84 species.

BEAL, F. E. L.

Food habits of the thrushes of the United States.

Bulletin 280, Bureau of Biological Survey, United States Department of Agriculture, September 27, 1915, pp. 1-23, with 2 text figures.

Some common birds useful to the farmer.

Farmer's Bulletin, no. 630, United States Department of Agriculture, February, 1915, pp. 1-27, with 23 text figures.

BISHOP, LOUIS B.

Description of a new race of Savannah Sparrow and suggestions on some California birds.

The Condor, September-October, 1915, vol. XVII, no. 5, pp. 185-189.

Describes *Passerculus sandwichensis brooksi* n. subsp., taken at Chilliwack, B.C. Contains also records of other varieties of this sparrow and of other species of birds from several localities in British Columbia and Saskatchewan.

BRADSHAW, F.

The Grouse of Saskatchewan.

Annual Report of the Saskatchewan Naturalists' Club, 1914. Appendix to Report of the Chief Game Guardian, Department of Agriculture, Saskatchewan, 1915, pp. 64-71, with 4 figures.

Gives descriptive notes on the five resident species of grouse and on their habits and distribution.

BROWN, W. J.

Bird Note.

The Ottawa Naturalist, February, 1915, vol. XXVIII, no. 11, p. 160.

Note on the observation of a flock of crows.

CHAPMAN, FRANK M.

Note on the plumage of North American Sparrows, Thirty-first paper.

Bird-lore, January-February, 1915, vol. XVII, no. 1, pp. 20-21.

Discusses the following species of Junco: Montana, Pink-sided, Ridgway's, Townsend's, Baird's, Guadalupe, Arizona, Red-backed and Grey-headed Juncos.

Notes on the plumage of North American Birds. Thirty-second paper.

Idem, March-April, 1915, vol. XVII, no. 2, p. 126.

Discusses Kennicott's Willow Warbler, the Ruby-crowned Kinglet, the Sickan, Dusky, Golden-crowned and Western Gold-crowned Kinglets.

Notes on the plumage of North American Birds. Thirty-fourth paper.

Idem, May-June, 1915, vol. XVII, no. 3, p. 203.

Discusses the Blue-gray, Western, Plumbeous and Blacktail Gnat-catchers.

Notes on the plumage of North American Birds. Thirty-fourth paper.

Idem, September-October, 1915, vol. XVII, no. 5, p. 378.

Discusses the Tufted, Black-crested, Plain and Bridled Titmouse.

Notes on the plumage of North American Birds.

Idem, November-December, 1915, vol. XVII, no. 6, pp. 445-446.

Discusses the White-breasted, Red-breasted, Brown-headed and Pygmy Nuthatches.

COALE, HENRY K.

The present state of the Trumpeter Swan (*Olor buccinator*).

The Auk, January, 1915, vol. XXXII, no. 1, pp. 82-90, with plates VII-X.

Gives information collected from the literature and by correspondence showing the present distribution of this rare bird in museums and private collections.

COOKE, WELLS W.

Bird Migration.

Bulletin 185, Bureau of Biological Survey, United States Department of Agriculture, April 17, 1915, pp. 1-47, with 4 plates and 20 text figures.

The text figures are maps showing the distribution and migration routes of various birds.

Distribution and Migration of North American Gulls and their allies.

Bulletin 292, Bureau of the Biological Survey, United States Department of Agriculture, October 25, 1915, pp. 1-70, with 31 text-figures.

The figures are maps showing the distribution and breeding areas of the various species.

Our shore birds and their future.

Yearbook, United States Department of Agriculture, Separate 642, 1915, pp. 275-294, with 3 plates and 3 text-figures.

The figures are maps showing the distribution of Wilson's Snipe, the Woodcock and the Eskimo Curlew.

The Migration of North American Sparrows, Thirty-second paper.

Bird-lore, January-February, 1915, vol. XVII, no. 1, pp. 18-19, with one coloured plate.

Describes the migration-routes and distribution of the following species of Junco: The Pink-sided, Grey-headed, Arizona, Baird's and the Guadalupe Juncos.

The Migration of North American Kinglets.

Idem, March-April, 1915, vol. XVII, no. 2, pp. 118-126, with one coloured plate.

Discusses the Kennicott Willow-Warbler, Golden-crowned kinglet and Ruby-crowned Kinglet.

The Migration of North American Birds.

Idem, May-June, 1915, vol. XVII, no. 3, pp. 198-203, with one coloured plate.

Discusses the Brown Creeper, Blue-gray Gnatcatcher, Plumbeous Gnatcatcher and Black-tailed Gnatcatcher.

The Migration of North American Birds.

Idem, September-October, 1915, vol. XVII, no. 5, p. 378, with one coloured plate.

Discusses the Tufted, Black-crested, Plain and Bridled Titmice.

The Migration of North American Birds.

Idem, November-December, 1915, vol. XVII, no. 6, pp. 443-445.

Discusses the White-breasted, Red-breasted, Brown-headed and Pygmy Nuthatches.

Bird Migration in the Mackenzie Valley.

The Auk, October, 1915, vol. XXXII, no. 4, pp. 442-459, with 5 maps, showing migration routes, breeding range, etc., of various species.

The Yellow-billed Loon: a problem in migration.

The Condor, November-December, 1915, vol. XVII, no. 6, pp. 213-214.

Suggests the probability of the winter home of this bird being in eastern Asia.

CRIDDLE, NORMAN.

Some habits of Swainson's Hawk in Manitoba.

The Ottawa Naturalist, November, 1915, vol. XXIX, no. 8, pp. 94-97.

An interesting paper on the nesting, feeding and defensive habits of this hawk.

DALE, MELVILLE.

August Bird Life at Pleasant Point, Ont.

Idem, March, 1915, vol. XXVIII, no. 12, pp. 168-174.

Describes the locality and gives an annotated list of 103 species of birds observed there.

DICKEY, S. S.

The Northern Raven.

The Oologist, July, 1915, vol. XXXII, no. 7, pp. 106-107.

An account of the habits of this bird.

DUNLOP, ERIC B.

Notes on Some Manitoba Birds.

The Auk, October, 1915, vol. XXXII, no. 4, pp. 500-501.

Gives records of 10 species of birds, with notes on their nesting habits.

GERALD, GEORGE E.

The American Merganser.

The Oologist, April, 1915, vol. XXXII, no. 4, pp. 66-67.

An account of the habits of this bird, as observed by the author on Muskoka Lake.

Late Nesting of the Wilson's Thrush.

Idem, December, 1915, vol. XXXII, no. 12, pp. 211-212.

Observations made at Sparrow Lake, Muskoka, Ont., on June 24-27, 1915.

GREY, H.

Bird notes from British Columbia and Southern California.

The Condor, January-February, 1915, vol. XVII, no. 1, p. 59.

Notes that *Pelecanus californicus* (California Brown Pelican) was said to have been seen at Esquimalt Harbour, B. C., on 1884.

HARRINGTON, PAUL.

Ontario, 1914, Nests.

The Oologist, June, 1915, vol. XXXII, no. 6, p. 99.

Observations on the nests of 12 species of birds found at Toronto, Wasago Beach and Thorah Island, Ont.

HENDERSON, A. D.

Nesting of the Great Grey Owl in Central Alberta. (*Scotiapex nebulosa nebulosa*).

The Oologist, January, 1915, vol. XXXII, no. 1, pp. 2-6, with 3 plates.

Describes the finding of the nest of this bird and also nests of the Western Horned Owl.

Drumming of the Ruffed Grouse.

Idem, July, 1915, vol. XXXII, no. 7, pp. 117-118.

HORSBRUGH, CHARLES B.

Ornithological Notes from the Alix and Buffalo Lake Districts, Province of Alberta, Canada, 1914.

The Ibis, October, 1915, Tenth Series, vol. 111, no. 4, pp. 670-689.

An annotated list of 80 species of birds from this district.

LE NATURALISTE CANADIEN. (Editorial).

Le faisan dans le Province de Québec.

Juin, 1915, vol. XLI (XXI of the new series), no. 12, p. 180.

MAYNARD, FRANK H.

Vancouver Island Birds.

The Oologist, January, 1915, vol. XXXII, no. 1, p. 19.

A list of 51 species of birds observed in this locality. The list is followed by "Notes on the Foregoing," by the editor (R. M. Barnes), in which various emendations are made.

MITCHELL, H. H.

Mallards wintering in Saskatchewan.

The Auk, April, 1915, vol. XXXII, no. 2, p. 225.

Notes on a number of mallards observed throughout the winter on Wascana Lake, near Regina, Sask.

Lewis's Woodpecker in Saskatchewan.

Idem, April, 1915, vol. XXXII, no. 2, p. 228.

Records the capture of a male adult of this species at Herchel, Sask.

Crows nesting on the ground.

Idem, April, 1915, vol. XXXII, no. 2, p. 229.

Several crows were found nesting on the ground on an island in Lost Mountain Lake, Sask.

MUNRO, J. A.

Two new records for British Columbia.

The Auk, January, 1915, vol. XXXII, no. 1, pp. 107, 108.

Records the Lark Bunting (*Calamospiza melanocorys*) and White-throated Sparrow, (*Zonotrichia albicollis*) and gives notes on three other species.

NORMAN, E. S.

Nesting of the Western Horned Owl in Northern Manitoba.*

The Oologist, January, 1915, vol. XXXII, no. 1, pp. 6-9.

Nesting of the Greater Yellow-legs in Manitoba. (Totanus melanoleucus).

Idem, August, 1915, vol. XXXII, no. 8, pp. 126-127.

Bird Notes from Mulverhill, Man.

The Ottawa Naturalist, October, 1915, vol. XXIX, no. 7, p. 73.

Brief notes on 5 species of birds.

REINECKE, EDWARD.

White-breasted Nuthatch.

The Oologist, December, 1915, vol. XXXII, no. 12, p. 212.

Records the finding of a cow-bird's egg in the nest of a white-breasted nuthatch, 50 feet from the ground, at Sherston, Ont.

ROGERS, CHARLES H. R.

Bird-lore's Fifteenth Christmas Census.

Bird-lore, January-February, 1915, vol. XVII, no. 1, pp. 22-48.

Data are given from the following Canadian localities: Arnprior, Franklin, Reaboro, London, Millbrook and Port Dover, Ont., and Yarmouth, N.S.

TAVERNER, P. A.

The Double-crested Cormorant (*Phalacrocorax auritus*) and its relation to the salmon industries on the Gulf of St. Lawrence.

Museum Bulletin, no. 5, Geological Survey of Canada, April 30, 1915, pp. 1-24, with Plate 1.

Suggestions for ornithological work in Canada.

The Ottawa Naturalist, April, 1915, vol. XXIX no. 1, pp. 14-18.

Idem, May, 1915, vol. XXIX, no. 2, pp. 21-28.

TERRILL, L. MCI.

Notes from the Laurentian Hills. Yellow-bellied Flycatcher, Golden-crowned Kinglet and Blackburnian Warbler.

The Wilson Bulletin, June, 1915, vol. XXVII, no. 2, pp. 302-309.

Gives notes on the nests and habitats of these birds.

*Corrected title, v. p. 22. The title as originally given—"Nesting of the Western Horned Lark in Central Alberta"—is erroneous.

THAYER, JOHN E.

Wilson's Snipe Wintering in Nova Scotia.

The Auk, July, 1915, vol. XXXII, no. 3, p. 368.

A specimen was shot at Wolfville, N.S., on Feb. 17. 1915.

TUFTS, ROBIE W.

Wilson's Snipe Wintering in Nova Scotia.

Bird-lore, May-June, 1915, vol. XVII, no. 3, p. 208.

Describes the wintering of this bird at Wolfville, N.S.

Winter Robins.

Idem, May-June, 1915, vol. XVII, no. 3, p. 212.

Observations on wintering robins in Nova Scotia.

WILLIAMS, M. Y.

Notes on the Herring Gull (*Larus argentatus*).

The Ottawa Naturalist, November, 1915, vol. XXIX, no. 8, pp. 89-90.

WRIGHT, ALBERT HAZEN.

Early Records of the Wild Turkey, III.

The Auk, January, 1915, vol. XXXII, no. 1, pp. 61-81.

Notes are given from Canada and various parts of the United States.

MAMMALIA.

ANDERSON, E. M.

Mammals collected in Atlin District, 1914.

Report of the Provincial Museum of Natural History for the year 1914.

Province of British Columbia, 1915, pp. F18-F19.

An annotated list of 17 species.

Revised list of mammals collected in the Okanagan Valley in 1913.

Idem, 1915, pp. F20-F21.

An annotated list of 19 species.

BAILEY, VERNON.

Revision of the Pocket Gophers of the Genus *Thomomys*.

North American Fauna, Bureau of the Biological Survey, United States Department of Agriculture, no. 39, Nov. 15, 1915, pp. 1-136, with Plates I-VIII, and 10 text figures.

An important monograph of this genus. Three races of *Thomomys talpoides* and two of *T. fuscus* are reported from Canadian localities.

BRADSHAW, F.

Gophers and Squirrels.

Annual Report of the Saskatchewan Naturalists' Club, 1914, Appendix to the Report of the Chief Game Guardian, Department of Agriculture, Saskatchewan, 1915, pp. 56-64, with 4 figures.

Gives brief descriptions of four species with notes on their habits and methods of control.

CRIDDLE, STUART.

The banded pocket mouse, *Perognathus fasciatus*, Wild.

The Ottawa Naturalist, January, 1915, vol. XXVIII, no. 10, pp. 130-134, with figure.

An account of the characteristics and habits of this animal in Manitoba.

Notes on a Wounded Deer.

Idem, May, 1915, vol. XXIX, no. 2, p. 32.

Describes the condition of a mule deer, shot by the author, which had been previously wounded and the genital glands destroyed.

DEARBORN, NED.

Silver Fox Farming in Eastern North America.

Bulletin no. 301, Bureau of the Biological Survey, United States Department of Agriculture, October 29, 1915, pp. 1-35, with 22 text figures.

HOWELL, ARTHUR H.

Revision of the American Marmots.

North American Fauna, no. 37, Bureau of the Biological Survey, United States Department of Agriculture, 1915, pp. 1-80, with Plates I-XV and 3 text figures.

An important paper containing extensive data on the habits, food, distribution, economic status and taxonomy of the marmots or woodchucks. Five races of *Marmota monax*, one of *M. flaviventris*, four of *M. caligata* and *M. vancouverensis* are reported from Canadian localities.

JACKSON, HARTLEY H. T.

A Review of American Moles.

North American Fauna, no. 38, Bureau of the Biological Survey, United States Department of Agriculture, September 1915, pp. 1-100, with plates I-VI and 27 text figures.

An important paper, giving extensive data on the taxonomy of this group. Five species are recorded from Canadian localities.

MARTIN, EDWARD T.

The Carnivora as Destroyers of Game.

Rod and Gun in Canada, October, 1915, vol. 17, no. 5, pp. 425-431.

TAYLOR, WALTER P.

Description of a new subgenus (*Arborimus*) of *Phenacomys*, with a contribution to knowledge of the habits and distribution of *Phenacomys longicaudus* True.

Proceedings of the California Academy of Sciences, Fourth Series, December, 1915, vol. 5, pp. 111-161, with Plate XV.

Phenacomys intermedius is recorded from two Canadian localities in Alberta and British Columbia.

TILLET, B. C.

The evolution of the sheep.

The Ottawa Naturalist, November, 1915, vol. XXIX, no. 8, pp. 90-93.

A brief popular account of the origin of wild and domesticated varieties of sheep.

MISCELLANEOUS.

ANDERSON, R. M.

The Canadian Arctic Expedition, 1913-14.

Report of the Biological Division—Zoology. Summary Report of the Geological Survey, for the calendar year 1914, Department of Mines, Canada, 1915, pp. 163-166.

An account of work done in collecting zoological material, including preliminary lists of birds and mammals obtained.

BRADSHAW, F.

Report of the Chief Game Guardian on matters relating to Game Protection, the Administration of the Game Act, and the Development of the Provincial Museum during 1914.

Department of Agriculture, Saskatchewan, 1915, pp. 1-71.

Includes reports of the various district game guardians, in which information is given on the distribution of game in various parts of the Province, and "A Report on the Bird Life contained within our Northern Territory," by A. Buchanan, with a list of species observed. (See also Bradshaw, F., under Aves and Mammalia).

CAMERON, A. T.

The iodine content of the marine flora in the neighbourhood of Nanaimo, Vancouver Island, B.C.

Contributions to Canadian Biology, 1911-1914. Fasciculus 1—Marine Biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 51-68.

Analyses were made of various species of Coelenterata, Annelida, Bryozoa, Echinodermata, Crustacea, Mollusca, Tunicata and Pisces.

DEPARTMENT OF GAME AND FISHERIES, ONTARIO.

Eighth Annual Report of the Game and Fisheries Department 1914, Toronto, 1915, pp. 1-134, with 4 coloured plates.

Information is given on the abundance or scarcity of fish, birds and mammals in various parts of Ontario. The coloured plates illustrate the Greater Yellow-legs, Blue-winged Teal, Brown Trout and Rainbow Trout.

HARPER, FRANCIS.

The Alaska-Great Slave Lake Expedition.

Report of the Biological Division—Zoology. Summary Report of the Geological Survey, for the calendar year 1914, Department of Mines, Canada, 1915, pp. 159-163.

Describes the itinerary of the expedition and the general biological conditions of the region, and gives notes on mammals and birds observed.

MACNAMARA, CHARLES.

The dangers of our wilds.

The Ottawa Naturalist, October, 1915, vol. XXIX, no. 7, pp. 69-73.

The writer points out that the dangers from plants are much greater than those from animals. References are made to various reptiles, birds and mammals.

PERRY, H. G.

Nature Study of Animals. Coverings of Animals.

Educational Review, March, 1915, vol. XXVIII, no. 10, pp. 216-217.

Nature Study of Animals, Bird Studies.

Idem, April, 1915, vol. XXVIII, no. 11, pp. 230-232, with 3 text figures.

Nature Study of Animals, Bird Study. The Frog.

Idem, May 1915, vol. XXVIII, no. 12, pp. 254-257, with 4 text figures.

Nature Study of Animals.

Idem, October, 1915, vol. XXIX, no. 5, pp. 78-81.

Nature Study of Animals.

Idem, November, 1915, vol. XXIX, no. 6, pp. 102-103, with figure.

This series of articles, including others dealing with insects, contain useful suggestions for teachers of Nature Study.

TAVERNER, P. A.

Report of the Biological Division—Zoology. Summary Report of the Geological Survey, for the calendar year 1914, Department of Mines, Canada, 1915, pp. 152-167.

An account of the work of the Division with lists of accessions to the Museum.

(See also Anderson, R. M., and Harper, Francis).

TILLET, B. C.

Mimicry—Some of Nature's Stratagems.

The Ottawa Naturalist, October, 1915, vol. XXIX, no. 7, pp. 74-76.

A popular account of the phenomena of protective coloration and mimicry, with references to various animals.

WALKER, E. M.

Bibliography of Canadian Zoology, 1913.

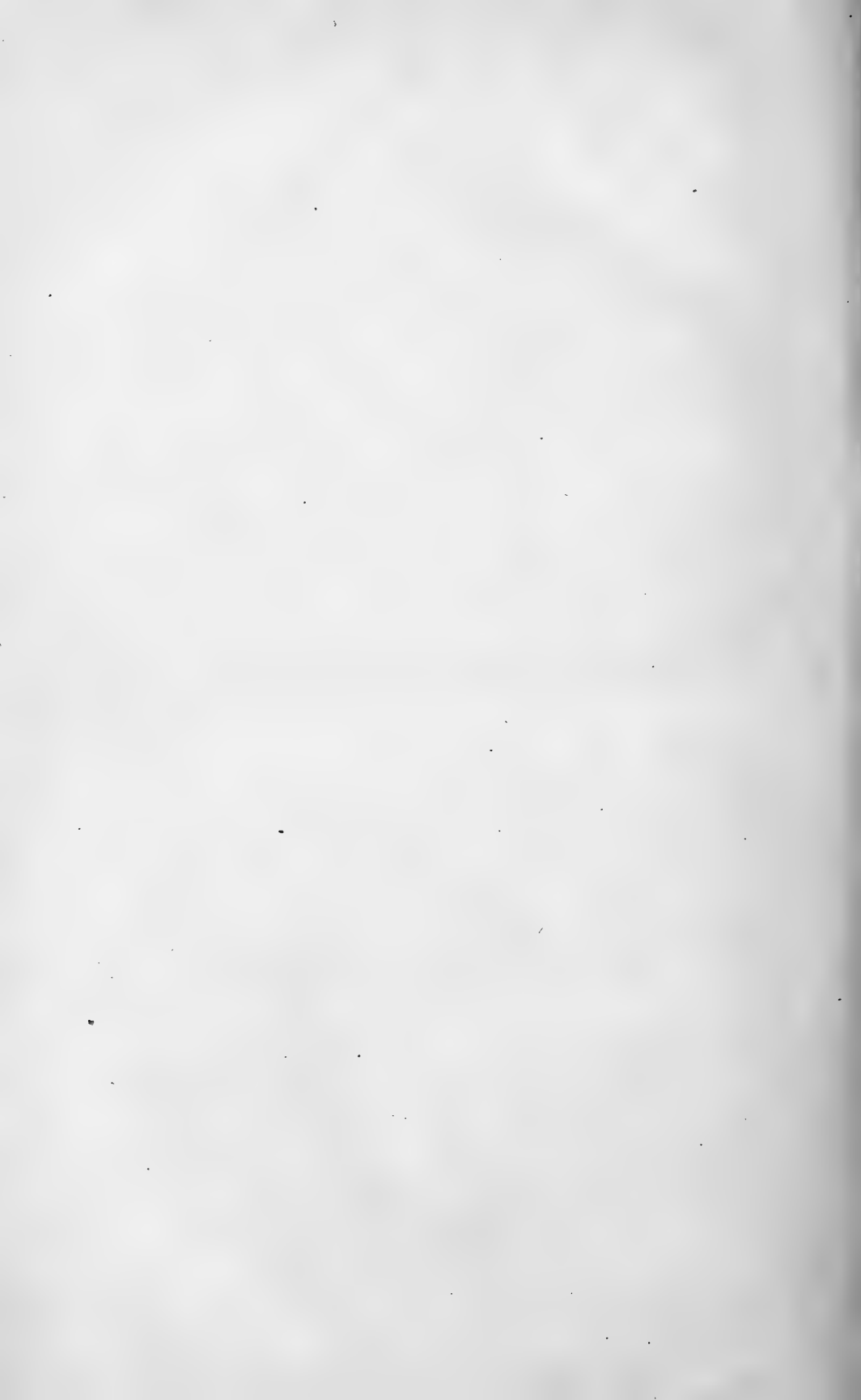
Transactions of the Royal Society of Canada—Third Series, 1914 (1915), vol. VIII, Sec. IV, pp. 271-285.

WILLEY, A.

The Plankton in St. Andrew's Bay.

Contributions to Canadian Biology, 1911-1914. Fasciculus 1—Marine Biology. Supplement to 47th Annual Report of the Department of Marine and Fisheries, Fisheries Branch, 1915, pp. 1-9, with figures 1 and 2.

A general sketch of certain features of the zooplankton of this region.







MBL WHOI Library - Serials



5 WHSE 04235

